



**Monitoring report form for CDM programme of activities
(Version 03.0)**

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT

Title of the PoA	DelAgua Public Health Program in Eastern Africa	
UNFCCC reference number of the PoA	PoA 9626	
Version numbers of the PoA-DD applicable to this monitoring report	Version 3.0	
Version number of this monitoring report	1	
Completion date of this monitoring report	29/01/2020	
Monitoring period number	3	
Duration of this monitoring period	15/09/2015-31/12/2018	
Monitoring report number for this monitoring period	1	
Coordinating/managing entity	DelAgua Health Rwanda Limited	
Host Parties	Host Party of the PoA	Is this the host Party of a CPA covered in this monitoring report? (yes/no)
	Rwanda	Yes
Applied methodologies and standardized baselines	AMS-III.AV. Low greenhouse gas emitting safe drinking water purification systems, Version 04 AMS II.G, Energy efficiency measures in thermal applications of non-renewable biomass, Version 07	
Sectoral scopes	Sectoral Scope – 3. Energy Demand	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0	994,875
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report	1,247,817	

PART I Monitoring of programme of activities (PoA)

SECTION A. Description of PoA

A.1. General description of PoA

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This PoA involves the distribution of LifeStraw® Family units and/or Dura high-efficiency cook stoves to households in the Republic of Rwanda, exclusive of those households in the case of the water filters that have existing running water in their homes.

The LifeStraw® Family is a point-of-use water filter that helps people access safe drinking water at home and outside. The LifeStraw® Family is an instant microbiological purifier that delivers at least 18,000 liters of EPA-quality drinking water¹. The LifeStraw® Family reduces the use and demand for firewood for water treatment by boiling. This directly leads to reduced CO₂ emissions.

The Dura is a high-efficiency, family-sized cook stove based on the 'rocket stove' concept of operation. These stoves are considerably more efficient than the standard three-stone-fire and reduce the use of NRB for cooking. Additionally, these stoves can achieve a complete burn of combustible materials resulting in little to no smoke, greatly improving indoor air quality.

These technologies are distributed directly to households. Distributions are coordinated and managed by DelAgua Health Rwanda Limited, in collaboration with the Rwandan Ministry of Health.

All CPAs included in this PoA are eligible to distribute both technologies. At this time, CPAs 1-7 have distributed water filters and cookstoves, while CPAs 8-16 have distributed only cookstoves. Only credits generated from cookstoves are quantified for this monitoring period; credits from water filters are not claimed for this monitoring period.

Table 1: Technologies Distributed By CPA

District	Technologies Distributed	
	Cookstoves	Filters
CPA001 – Rubavu	Yes	Yes
CPA002 – Karongi	Yes	Yes
CPA003 – Ngororero	Yes	Yes
CPA004 – Nyabihu	Yes	Yes
CPA005 - Nyamasheke	Yes	Yes
CPA006 – Rutsiro	Yes	Yes
CPA007 – Rusizi	Yes	Yes
CPA008 – Bugesera	Yes	No
CPA009 – Burera	Yes	No
CPA010 – Gatsibo	Yes	No
CPA011 – Rulindo	Yes	No
CPA012 – Kayonza	Yes	No
CPA013 – Kirehe	Yes	No
CPA014 – Ngoma	Yes	No
CPA015 – Nyagatare	Yes	No

¹ Clasen, T. et al. 2009. Laboratory assessment of a gravity-fed ultrafiltration water treatment device designed for household use in low-income settings. *Am. J. Trop. Med. Hyg.*, 80(5), 2009, pp. 819–823”.

CPA016 - Rwamagana	Yes	No
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A.1.1. Corresponding generic component project activities (CPAs)

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
CPA XXX – DelAgua Public Health Program: CPAXX in YY District in the ZZ Province of the Republic of Rwanda	Version 3.0	Sectoral Scope – 3. Energy Demand	AMS-III.AV. Low greenhouse gas emitting safe drinking water purification systems, Version 04 AMS II.G, Energy efficiency measures in thermal applications of non-renewable biomass, Version 07

A.1.2. CPAs included in the PoA

Title and UNFCCC reference number of the CPA	Version of the PoA-DD	Title and reference number of the corresponding generic CPA	Crediting period type and duration	Covered in this monitoring report? (yes/no)
DelAgua Rwanda Public Health Program: Rubavu District, Western Province, Republic of Rwanda. 9626-P1-0001-CP1	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program: CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	15/09/2014 - 14/09/2021	Yes
DelAgua Rwanda Public Health Program: CPA002, Ubedehe 1& 2 in Karongi District in the Western Province of the Republic of Rwanda 9626-P1-0002-CP1	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program: CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	15/09/2014 - 14/09/2021	Yes
DelAgua Rwanda Public Health Program: CPA003, Ubedehe 1& 2 in Ngororero District in the Western Province of the Republic of Rwanda 9626-P1-0003-CP1	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program: CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	15/09/2014 - 14/09/2021	Yes
DelAgua Rwanda Public Health Program: CPA004, Ubedehe 1& 2 in Nyabihu District in the Western Province of the Republic of Rwanda 9626-P1-0004-CP1	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program: CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	15/09/2014 - 14/09/2021	Yes
DelAgua Rwanda Public Health	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program:	15/09/2014 -	Yes

Program: CPA005, Ubedehe 1& 2 in Nyamasheke District in the Western Province of the Republic of Rwanda 9626-P1-0005-CP1		CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	14/09/2021	
DelAgua Rwanda Public Health Program: CPA006, Ubedehe 1& 2 in Rutsiro District in the Western Province of the Republic of Rwanda 9626-P1-0006-CP1	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program: CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	15/09/2014 - 14/09/2021	Yes
DelAgua Rwanda Public Health Program: CPA007, Ubedehe 1& 2 in Rusizi District in the Western Province of the Republic of Rwanda 9626-P1-0007-CP1	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program: CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	15/09/2014 - 14/09/2021	Yes
DelAgua Rwanda Public Health Program: CPA008- BUGESERA District in the Eastern Province of the Republic of Rwanda 9626-P1-0008-CP1	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program: CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	19/04/2016 - 18/04/2023	Yes
DelAgua Rwanda Public Health Program: CPA009- BURERA District in the Northern Province of the Republic of Rwanda 9626-P1-0009-CP1	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program: CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	19/04/2016 - 18/04/2023	Yes
DelAgua Rwanda Public Health Program: CPA010- GATSIBO District in the Eastern Province of the Republic of Rwanda 9626-P1-0010-CP1	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program: CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	19/04/2016 - 18/04/2023	Yes
DelAgua Rwanda Public Health Program: CPA011- RULINDO District in the Northern Province of the Republic of	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program: CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	19/04/2016 - 18/04/2023	Yes

Rwanda 9626-P1-0011-CP1				
DelAgua Rwanda Public Health Program: CPA012- KAYONZA District in the Eastern Province of the Republic of Rwanda 9626-P1-0012-CP1	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program: CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	19/04/2016 - 18/04/2023	Yes
DelAgua Rwanda Public Health Program: CPA013- KIREHE District in the Eastern Province of the Republic of Rwanda 9626-P1-0013-CP1	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program: CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	19/04/2016 - 18/04/2023	Yes
DelAgua Rwanda Public Health Program: CPA014- NGOMA District in the Eastern Province of the Republic of Rwanda 9626-P1-0014-CP1	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program: CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	19/04/2016 - 18/04/2023	Yes
DelAgua Rwanda Public Health Program: CPA015- NYAGATARE District in the Eastern Province of the Republic of Rwanda 9626-P1-0015-CP1	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program: CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	19/04/2016 - 18/04/2023	Yes
DelAgua Rwanda Public Health Program: CPA016- RWAMAGANA District in the Eastern Province of the Republic of Rwanda 9626-P1-0016-CP1	Version 4.2	CPA XXX - DelAgua Rwanda Public Health Program: CPAXX, in YY District in the ZZ Province of the Republic of Rwanda	19/04/2016 - 18/04/2023	Yes

A.2. Coordinating/managing entity

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DelAgua Health Rwanda Limited

SECTION B. Implementation of PoA**B.1. Description of implemented PoA**

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The management system is based on EB 65, Annex 3 “Standard for Demonstration of Additionality, Development of Eligibility Criteria, and Application of Multiple Methodologies for Programme of Activities”, Version 3.0, and is comprised of the following element:

- (a) A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies;

CPA Implementer is responsible for developing the CPA-DD, and for gathering all required documentation to demonstrate compliance with the eligibility criteria. The CPA-DD and supporting documentation were submitted to the Program Director of DelAgua. The Program Director was responsible the process of inclusion of CPAs.

- (b) Records of arrangement for training and capacity development for personnel;*

The CME trained all staff involved in education and monitoring activities. The CME ensured training of all on-site staff with respect to adherence to the Monitoring Plan of the project activity. Records of the training will be kept for at least 2 years after the end of the crediting period of the relevant project activity.

- (c) Procedures for technical review of inclusion of CPAs;*

All CPAs are owned and managed by DelAgua, the CME. The Program Director of DelAgua designated appropriately trained technical staff to draft the CPA-DD and to gather sufficient documentation to demonstrate compliance with the eligibility criteria defined in section B.2 above.

- (d) A procedure to avoid double accounting (e.g. to avoid the case of including a new CPA that has been already registered either as CDM project activity or as a CPA of another PoA);*

All CPAs were implemented by the CME, thus ensuring that the operator is aware of and agrees that the water filter and/or high efficiency stove distribution is included in this PoA confirms that no emission reduction benefit from the project shall be claimed by it through any other instrument either as a standalone project or as a CPA to any other PoA.

- (e) Records and documentation control process for each CPA under the PoA;*

The monitoring plan for this project is closely derived from the methodologies. A database for the project activity was maintained continuously. The monitoring plan consists of checking a representative sample of all appliances at least once every two years to ensure that they are still operating or are replaced by an equivalent in service appliance.

A POA-level project database was maintained, which contains distribution records for each water filter and cookstove issued, subsequent replacements, as well as detailed data on the representative sample surveyed for monitoring purposes. The database is accessible to the project proponent, appropriate partners, and the verification DOE. The database includes the following:

- Unique identification number
- Installation date
- First and last name
- Contact details of user (where available)
- Baseline cooking fuel source
- Baseline stove type
- Date of replacement of filter and/or stove units
- Monitored parameters

Additionally, the CME has kept:

- CPA-DDs and supporting documentation
- Training records
- Database backups

The database is available to select a random, representative sample from for monitoring and verification purposes. This sample set will be integrated into the database to include additional monitoring parameters as required or as appropriate.

(f) Measures for continuous improvements of the PoA management system;

An internal audit of all monitoring and education records was conducted in preparation for this verification. Distribution records were reviewed and cleaned to ensure accuracy, and the monitoring survey was reviewed by senior staff to ensure that the requirements of the monitoring plan were met. Monitoring survey responses were reviewed by senior staff to ensure that the requirements of the monitoring plan were met. In addition, the verification survey questions were revised following the Forward Action Requests issued during the third verification. These revisions are as follows:

FAR	How Addressed
FAR 1- As a result of FAR 01 from the 2nd verification period, the CME adjusted the monitoring survey questionnaire/09/ to address seasonality of use with end users. During the 3rd verification site visit survey, ERM CVS noted that a few end users that had reported no change in usage during changed seasons, also reported that they continued to use their baseline stoves (as a secondary stove) in some cases because they couldn't use the project stoves when their firewood is wet/when it rains. ERM CVS therefore noted that the design of the survey is such that there are opportunities missed to address the inconsistencies in end user responses with reference to seasonality. FAR 01 is raised because in order to clarify the end user responses with reference to seasonality of usage of stoves, the sequence of questions (esp. with regards to the continued use of traditional/baseline stoves) should be reviewed.	The order of the survey questions was revised so that end users are asked why they continue using traditional stoves, before asking seasonality questions. During pre-survey training, all survey questions were reviewed/discussed with surveyors, and surveyors were informed of the change in the order of the questions. Training included a review of inconsistencies in the previous survey, and surveyors were instructed to ensure usage quantities are consistent with previous survey responses.

B.2. Post-registration changes to PoA

B.2.1. Corrections

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N/A

B.2.2. Inclusion of monitoring plan

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N/A

B.2.3. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

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On 23 February 2017, the EB approved a permanent change to the PoA-DD for this monitoring period. These changes are represented in version 3.0 of the PoA-DD, and include the application of AMS-II.G, v07 (previously AMS-II.G v05 was applied).

B.2.4. Changes to programme design

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N/A

B.2.5. Changes specific to afforestation or reforestation activities

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N/A

PART II Monitoring of CPAs

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Each CPA involves the distribution of water filters and/or high-efficiency cook stoves in an established district in an established province in Rwanda. The distributions were coordinated and managed by DelAgua. Distributions occurred in two groups. Under Group 1, stoves and filters were distributed to 100906 households within 72 sectors of CPAs 1-7, during the first monitoring period. Group 2 included distribution of stoves to 195,227 households in CPAs 1-16; 156,291 households were in CPAs 8-16, and 38,936 households were located within 24 sectors of CPA 1-7 that did not receive technologies under Group 1. Group 2 distributions occurred between March and December, 2016. The number of technologies distributed within each district/CPA is as follows:

Table 2: Households By Group & CPA

District	Total Households Group 1	Total Households Group 2
CPA001 - Rubavu	10582	7,295
CPA002 - Karongi	14548	4,303
CPA003 - Ngororero	17912	5,031
CPA004 - Nyabihu	10734	3,042
CPA005 - Nyamasheke	13963	5,801
CPA006 - Rutsiro	16867	6,111
CPA007 - Rusizi	16300	7,353
CPA008 - Bugesera	0	23,637
CPA009 - Burera	0	22,049
CPA010 - Gatsibo	0	21,786
CPA011 - Rulindo	0	15,066
CPA012 - Kayonza	0	13,394
CPA013 - Kirehe	0	13,955
CPA014 - Ngoma	0	15,515
CPA015 - Nyagatare	0	15,724
CPA016 - Rwamagana	0	15,165
Total	100906	195,227

Project activities implementing AMS-II.G qualify as Type II small-scale projects, and therefore shall not exceed energy savings of 180 GWh per year² from cook stoves. Each Group 1 stove

² Clarification on the threshold of thermal energy savings in AMS-II.G: http://cdm.unfccc.int/filestorage/A/M/ /AM_CLAR_VIIC5MTUJWR9PRPJL0EXOT3G2CKSFQ/Response%20SSC%20WG%20provided.pdf?t=WWN8bTk0eGFxDapi7E1q-CgA9Aks0vN82S6

generated a maximum of 0.007 GWh of energy savings annually³⁴, and so a CPA could distribute up to 25,611 stoves⁵. The greatest number of stoves distributed in any CPA is 23,637, and therefore the CPAs meet the Type II threshold.

SECTION C. Implementation of CPAs

C.1. Description of implemented CPAs

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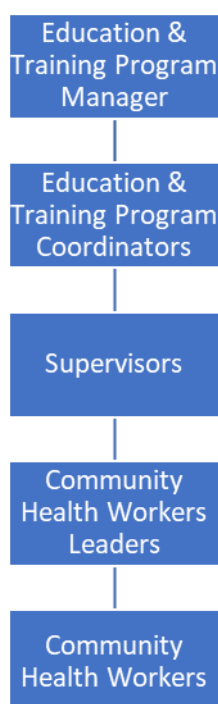
As described above, distributions are separated into two groups, depending on the time period that technologies were distributed (Group 1 distributions took place in 2014, while Group 2 distributions occurred in 2016), and the combination of technologies provided to the household (Group 1 distributions included stoves and filters, while Group 2 distributions included stoves only). For clarity, Group 1 and Group 2 distributions are not to be confused with “batches.” DelAgua records the distribution date of every technology distributed under the PoA, and therefore does not aggregate technologies in batches. According to the approved monitoring plan, monitoring must be conducted separately for end-users with similar characteristics; combination of technologies distributed and the installation are characteristics that are considered. Therefore, the PoA population is separated into Groups to comply with the monitoring plan.

693 stoves were distributed under Group 2 during this monitoring period. These stoves were distributed between November 7, 2016 and December 1, 2016, and were part of the distribution program that began in monitoring period 3. Distributions were coordinated and managed by CME staff, and utilized the Rwandan Ministry of Health’s network of collaboration with Community Health Workers (CHWs). The structure of the team responsible for technology distribution was as follows:

³ Calculations provided to DOE.

⁴ This calculation assumes that a filter is not present in the household, and so cross-effects is not accounted for. Accounting for cross-effects would increase the number of stoves that could be distributed under any CPA, and so this is a conservative approach to ensuring compliance with the threshold. This calculation is also based on the HHsize of Group 1 households; Group 1 HHs were larger (4.83 people vs. 4.35 people in Group 2). Since a stove in a larger HH would save more energy, this is also a conservative approach for ensuring compaling with the threshold.

⁵ This PoA includes several combinations of technologies, including Group 1 stoves with cross-effects, Group 1 stoves without cross-effects, and Group 2 stoves without cross-effects. The energy saved from each stove combination was calculated, and the minimum number of stoves of any type is presented here. Cross-effects are further discussed in Section F.1, while Groups are further discussed in Part II above.



Beneficiary households were identified based on Ubedehe lists developed by local authorities and approved by the government of Rwanda. All beneficiary households were members of Ubedehe 1 or 2. Product distribution occurred at the cell level, and involved a two-step process; the initial distribution, and household (HH) visits.

The initial distributions for each Group were implemented by teams of trained CHWs (see training program below), and the team was overseen by supervisors. HHs came to a central distribution point, where they received a training on the use of technologies. Following this training, each Group 1 HH received a stove (Group 1 HHs received a filter and stove), and CHWs collected basic HH identification information on smart phones. The information collected during the initial distributions includes the following:

- Installation date
- Family name
- Contact details of user (where available)
- Socio-economic level (according to the Rwandan Ubudehe approach).
- Water filter barcode
- High efficiency stove barcode

Following the initial distribution, CHWs then visited each beneficiary HH, to conduct an in-home training to reinforce the proper use and maintenance of the technology, to respond to beneficiary questions about the program, and to conduct a household survey to collect more detailed information, including

- Baseline cooking fuel source
- Baseline stove type

Three different trainings were conducted in preparation for for Group 2 distributions during this monitoring period (similar trainings were conducted prior to Group 1 distributions in 2014). The sixteen District Managers (DMs) in Eastern and Northern Province received a one-week training conducted by the Education and Training Program Manager. The DMs then conducted 1.5 day trainings in each district for the CHWs. Following the first day of the CHW training, a CHW leader was selected, and these individuals received an additional 2 hour training.

The CHW training focused on:

- Household Visit Communication Tools, including use of the smart phone for data collection surveys
- Technology Trainings

- Distribution Meeting Training
- Basics of conducting a survey
- Basics of communication

The supervisor training focused on the above elements, as well as the following:

- Leadership and Communication Training
- Administrative Tasks

In addition to these distributions, CHW teams conducted follow-up HH visits to each beneficiary HH, to ensure the continued proper use of technologies and to identify maintenance concerns. The structure of the follow-up program was similar to the initial distributions. District Managers spent 1 day retraining each CHW team. CHWs then visited HHs, with one CHW visiting each house (the District Manager spent 3 or 4 days conducting visits with CHWs, to ensure consistency in survey delivery. During these visits, CHWs identified units that needed repair or replacement, and recorded this information in the CHW survey (via smart-phone). This information is currently being stored until DelAgua has the necessary parts. The CME has also established a call-center so that households can notify DelAgua when technologies need to be repaired or replaced. Households were informed of this during the initial distribution and made aware of it again during follow-up visits.

As documented, in the PoA-DD, the operational lifetime of each stove is expected to be 6-7 years. Group 1 technologies were distributed between September and December of 2014, while Group 2 technologies were distributed in 2016. Therefore, the oldest stoves distributed under this PoA were approximately 3 years old at the end of this monitoring period. Efficiency tests on these stoves found that the average efficiency has not dropped below 20%, as described under parameter $\eta_{\text{new},i,j}$.

C.2. Location of CPAs

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Each specific case CPA is in a different district in the Western, Northern and Eastern Provinces of Rwanda, as follows:

- CPA001 – Rubavu
- CPA002 – Karongi
- CPA003 – Ngororero
- CPA004 - Nyabihu
- CPA005 – Nyamasheke
- CPA006 - Rutsiro
- CPA006 - Rutsiro
- CPA007 - Rusizi
- CPA008 – Bugesera
- CPA009 - Burera
- CPA010 - Gatsibo
- CPA011- Rulindo
- CPA012 – Kayonza
- CPA013 - Kirehe
- CPA014 – Ngoma
- CPA015 – Nyagatare
- CPA016 - Rwamagana

C.3. Post-registration changes to CPAs

C.3.1. Temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies, standardized baselines or other methodological regulatory documents

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1. Two sets of monitoring surveys were conducted during this monitoring period. According to the registered monitoring plan, most parameters are required to be monitored annually. However, more than a year elapsed between each set of monitoring surveys because DelAgua did not have sufficient funds to complete the required surveys on schedule. The necessary funds were secured from an outside investment group in late April 2018, and survey activities commenced thereafter. This delay in monitoring would not be expected to increase emission reduction estimates because stove and filter usage tends to decline over time, as maintenance issues increase and end-users revert to their traditional behaviours. As shown in the table below, this trend is observed in the monitoring results for this project. Therefore, the delay in monitoring survey implementation does not lead to an increase in estimated credits.

	MP1	MP2	MP3*	MP4
% of cooking on project stove	84.5%	77.85%	65.62%	63.03%
Liters filtered per year, per household	2608	2605	2,304	2,022
Operating Fraction – filters	91.34%	86.02%	82.72	72.90
Operating Fraction – stoves	99.44%	98.92%	96.91	86.45

2. Due to an error in the monitoring plan, water quality was not properly monitored during this monitoring period. Therefore, emission reductions from water filters are not claimed during this period. Water filters were otherwise monitored properly, and emission reductions from cookstoves were adjusted to account for cross-effects.

C.3.2. Corrections

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N/A

C.3.3. Changes to the start date of the crediting period

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N/A

C.3.4. Inclusion of monitoring plan

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N/A

C.3.5. Permanent changes to the included monitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

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On 23 February 2017, the EB approved a permanent change to the PoA-DD for this monitoring period. These changes the application of AMS-II.G, v07 (previously AMS-II.G v05 was applied), and are represented in version 3.0 of the PoA-DD and version 3.0 of the CPA-DDs.

C.3.6. Changes to project design

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N/A

C.3.7. Changes specific to afforestation or reforestation CPA

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N/A

SECTION D. Description of monitoring system of CPAs

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The monitoring plan for this project is closely derived from the methodologies. A database for the project activity as maintained by the CME, and a representative sample of all appliances in each Group was monitored to ensure that they are still operating or are replaced by an equivalent in service appliance.

The project database was populated during the initial distribution of technologies, and was updated based on subsequent replacements. The database was made accessible to the project proponent, appropriate partners, and the verification DOE. The database includes the following:

- Unique CPA identification number
- Installation date
- Family name
- Contact details of user (where available)
- Socio-economic level (according to the Rwandan Ubudehe approach).
- Baseline cooking fuel source
- Baseline stove type
- Date of replacement of filter or cook stove units
- Monitored parameters, for each HH selected in the verification sample

The monitoring surveys established the time to end of life of the filters distributed, based on the rated capacity divided by the average number of people in the household, divided by the average volume of water consumed per person per day. In this way, the PP will establish the need to replace filter units in CPA regions. The monitoring survey also established usage rates and performance of the filter units. Likewise, monitoring surveys included examination of the cookstove installations and verification that they are in an operational condition. Therefore, should some filter or stove units not be replaced appropriately, this is accounted for and appropriately deducted from emission reduction claims.

SECTION E. Data and parameters**E.1. Data and parameters fixed ex ante**

(Copy this table for each data or parameter.)

Data / Parameter	EF _{projected_fossilfuel}
Unit	tCO ₂ /TJ
Description	Emission factor for the projected fossil fuel consumption in the baseline, when NRB is displaced.
Source of data	AMS-II.G & AMS-III.AV
Value(s) applied	81.6 tCO ₂ /TJ
Choice of data or measurement methods and procedures	Methodological default
Purpose of data	Calculation of baseline emissions for AMS-III.AV Calculation of emission reductions from AMS-II.G
Additional comment	-

Data / Parameter	LF
Unit	Fraction
Description	Leakage factor applied to account for increase in NRB use outside the project boundary
Source of data	Default value
Value(s) applied	0.95
Choice of data or measurement methods and procedures	Methodological default
Purpose of data	Calculation of leakage
Additional comment	-

Data / Parameter	$f_{NRB,y}$
Unit	Fraction
Description	Fraction of biomass used in the absence of the project activity in year y that can be established as non-renewable biomass.
Source of data	Default values are used as published in EB 67 Annex 22 "Default Values for Fraction of Non-Renewable Biomass for Least-Developed Countries and Small Island Developing States".
Value(s) applied	Rwanda: 0.98
Choice of data or measurement methods and procedures	Methodological default
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	WH
Unit	(kJ/L °C)
Description	Specific heat of water
Source of data	AMS.III.AV default value
Value(s) applied	4.186
Choice of data or measurement methods and procedures	Methodological default
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	T_i
Unit	°C
Description	Initial temperature of water
Source of data	AMS.III.AV default value
Value(s) applied	20
Choice of data or measurement methods and procedures	Methodological default
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	T_f
Unit	°C
Description	Final temperature of water
Source of data	AMS.III.AV default value
Value(s) applied	100
Choice of data or measurement methods and procedures	Methodological default
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	WHE
Unit	(kJ/L)
Description	Latent heat of water evaporation
Source of data	AMS.III.AV default value
Value(s) applied	2260
Choice of data or measurement methods and procedures	Methodological default
Purpose of data	Calculation of baseline emissions.
Additional comment	Used for water treatment calculation.

Data / Parameter	Xboil
Unit	Fraction
Description	The proportion of total population for which the common practice of water boiling is or would have been water boiling.
Source of data	Default value for Case 1
Value(s) applied	100%
Choice of data or measurement methods and procedures	According to the methodology, this parameter is only reported for Case 2 CPAs. Therefore, a value of 100% is applied, as all CPAs are Case 1.
Purpose of data	Calculation of emissions
Additional comment	This parameter is only relevant for Group 1 HHs.

Data / Parameter	IMP _{frac}
Unit	Fraction
Description	Determination of CPAs that fall under Case 1 or Case 2 (a proportion of the included population using an improved drinking-water source equal to or less than 60%).
Source of data	Baseline water quality study conducted independently by the London School of Hygiene and Tropical Medicine in September and October 2012
Value(s) applied	18.9%
Choice of data or measurement methods and procedures	Third party survey conducted by the London School of Hygiene and Tropical Medicine
Purpose of data	Required to validate emission reductions.
Additional comments	This parameter is only relevant for Group 1 HHs.

Data / Parameter	Case 1/Case 2
Unit	Dimensionless
Description	CPAs fall under Case 1 if they are implemented in rural or urban areas and the proportion of the populations using an improved drinking-water source is equal to or less than 60% If the CPA does not fall under Case1, it is Case 2
Source of data	See IMPfrac parameter
Value(s) applied	Case 1
Choice of data or Measurement methods and procedures	As IMPfrac is <60%, all CPAs are Case 1
Purpose of data	Calculation of baseline emissions
Additional comment	This parameter is only relevant for Group 1 HHs.

Data / Parameter	B _{old,i,j}
Unit	t /year
Description	Annual quantity of woody biomass used in pre-project scenario, per device.
Source of data	Calculated as B _{old,i,j,pp} * HH _{size} . A default value of 0.5 tonnes/capita per year is used for B _{old,i,j,pp} prior to adjustment for cross-effects. Number of persons served per device shall be monitored (see note #2 in additional comments)
Value(s) applied	Calculated
Choice of data or measurement methods and procedures	To account for cross-effects, B _{old,i,j,pp} is reduced to remove biomass consumption that would have been for water treatment purposes. This process is described in Section F.1, and is applicable to Group 1 only

Purpose of data/parameter	Calculation of emission reductions.
Additional comment	If a HH receives both water filters and cookstove, and the filter is found to be in operation, $B_{old,i,j}$ is reduced to remove biomass consumption that would have been for water treatment purposes. This adjustment is described in section F.1. According to the methodology $B_{old,i,j}$ is determined ex-ante, based on a value for the number of persons that utilize each device (represented by the parameter HH_{size}). However, the EB-approved cross-effects calculations used under this PoA allows for a monitored value of HH_{size}. Combining a monitored value of HH_{size} for the purpose of calculating cross effects, with a fixed value of HH_{size} for the purpose of calculating $B_{old,i,j}$, can result in overstated emission reductions, if the monitored value is less than the ex-ante value. As the cross-effects calculation (based on monitoring HH_{size}) was approved by the EB, and to avoid over-estimating emission reductions, CPAs within the PoA update $B_{old,i,j}$ based on monitored values of household size.

E.2. Data and parameters monitored

As described in section E.3, three sets of monitoring surveys were conducted during this monitoring period. The results presented below are the results of the second set of surveys. Other survey results are presented in the Appendix.

Parameters common to III.AV and II.G

Data / Parameter	η_{wb} ; η_{old}
Unit	%
Description	Efficiency of pre - project device. If the device is a three stone fire using firewood (not charcoal) , or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney, a default value of 0.1 is used as per the applied methodology; a value of 0.5 is used for fossil fuel combustion systems, and a default value of 0.2 is used for other types of devices. Use weighted average values (taking the amount of woody biomass consumed by each device as the weighting factor) if more than one type of device is being replaced
Measured/calculated/ default	Measured, using surveyed data and default values.
Source of data	Default value for stove efficiency combined with surveys of Group 1 and Group 2 households to determine the type of baseline device used in households and the amount of woody biomass consumed by each device.
Value(s) of monitored parameter	10.26% (for Group 1 and Group 2)
Monitoring equipment	Sampling was conducted in accordance with the sampling plan outlined in section B.7.2. Sampling was conducted at the time of distribution
Measuring/reading/recording frequency	This parameter is determined during technology distribution, and fixed thereafter.

Calculation method (if applicable)	Households were asked the following questions: (1)What was the predominant baseline stove used prior to the intervention? (2)How many times was it typically used to cook per week. (3)What other types of baseline stoves were used prior to the intervention? (4)For each other stove, how many times was it typically used to cook per week. (5)Did each baseline stoves have a grate or chimney. Based on the stove type and the presence of a grate/chimney, an efficiency value was assigned to each stove. The weighted average efficiency was then calculated based on the number of cooking events per stove.
QA/QC procedures	According to the QA/QC procedures in the registered monitoring plan, an outlier analysis shall be conducted. In this case, the outlier analysis would have removed higher efficiency values associated with improved stoves, resulting in a baseline efficiency of 10%. To ensure that all reasonable results were included in the final result, the outlier analysis was not conducted.
Purpose of data	Calculation of baseline and project emissions.
Additional comments	-

Data / Parameter	$\mu_{y,i,j}$			
Unit	Days			
Description	Number of days of utilization of the project device i and batch j during the year y			
Source of data	Household Surveys			
Value(s) applied		Group 1		Group 2
		Stove	Filter	Stove
	CPA001	243.55	267.65	293.84
	CPA002	243.55	267.65	293.84
	CPA003	243.55	267.65	293.84
	CPA004	243.55	267.65	293.84
	CPA005	243.55	267.65	293.84
	CPA006	243.55	267.65	293.84
	CPA007	243.55	267.65	293.84
	CPA008	243.55	267.65	293.84
	CPA009	-	-	293.84
	CPA010	-	-	293.84
	CPA011	-	-	293.84
	CPA012	-	-	293.84
	CPA013	-	-	293.84
	CPA014	-	-	293.84
	CPA015	-	-	293.84
CPA016	-	-	293.84	

Monitoring equipment	Surveys																																																																																	
Measuring/reading/recording frequency	Annually																																																																																	
Calculation method (if applicable)	The number of days that a technology is deployed will be calculated based on the average operating period of all similar technologies within a CPA. The steps to determining the average operating period is as follows: 1. The number of days that technologies are deployed is determined from the PoA database, based on the average distribution date within a CPA. Days Deployed <table border="1"> <thead> <tr> <th></th><th colspan="2">Group 1</th><th>Group 2</th></tr> <tr> <th></th><th>Stove</th><th>Filter</th><th>Stove</th></tr> </thead> <tbody> <tr><td>CPA001</td><td>420</td><td>420</td><td>420</td></tr> <tr><td>CPA002</td><td>420</td><td>420</td><td>420</td></tr> <tr><td>CPA003</td><td>420</td><td>420</td><td>420</td></tr> <tr><td>CPA004</td><td>420</td><td>420</td><td>420</td></tr> <tr><td>CPA005</td><td>420</td><td>420</td><td>420</td></tr> <tr><td>CPA006</td><td>420</td><td>420</td><td>420</td></tr> <tr><td>CPA007</td><td>420</td><td>420</td><td>420</td></tr> <tr><td>CPA008</td><td>420</td><td>420</td><td>420</td></tr> <tr><td>CPA009</td><td>-</td><td>-</td><td>420</td></tr> <tr><td>CPA010</td><td>-</td><td>-</td><td>420</td></tr> <tr><td>CPA011</td><td>-</td><td>-</td><td>420</td></tr> <tr><td>CPA012</td><td>-</td><td>-</td><td>420</td></tr> <tr><td>CPA013</td><td>-</td><td>-</td><td>420</td></tr> <tr><td>CPA014</td><td>-</td><td>-</td><td>420</td></tr> <tr><td>CPA015</td><td>-</td><td>-</td><td>420</td></tr> <tr><td>CPA016</td><td>-</td><td>-</td><td>420</td></tr> </tbody> </table> 2. The number of days that stoves & filters were not working was determined during HH visits conducted by CHWs (not during the same verification survey as other monitored parameters). Days Technologies Not Working <table border="1"> <thead> <tr> <th>Group</th><th>Stove</th><th>Filter</th></tr> </thead> <tbody> <tr> <td>Group 1</td><td>33.57</td><td>51.86</td></tr> <tr> <td>Group 2</td><td>14.52</td><td>NA</td></tr> </tbody> </table> 3. The final step is different for stoves and filters For stoves, the days in the field was discounted by continued usage of the baseline stove. Usage was captured by verification survey questions designed to capture the cooking habits and stove usage of households in the region were conducted Households were asked as to their frequency of use of the improved stove versus the baseline stove, and the baseline fuel consumption was adjusted on the CPA household level to account for the average continued use of the baseline stove. For example, household surveys in a CPA may have reported a total		Group 1		Group 2		Stove	Filter	Stove	CPA001	420	420	420	CPA002	420	420	420	CPA003	420	420	420	CPA004	420	420	420	CPA005	420	420	420	CPA006	420	420	420	CPA007	420	420	420	CPA008	420	420	420	CPA009	-	-	420	CPA010	-	-	420	CPA011	-	-	420	CPA012	-	-	420	CPA013	-	-	420	CPA014	-	-	420	CPA015	-	-	420	CPA016	-	-	420	Group	Stove	Filter	Group 1	33.57	51.86	Group 2	14.52	NA
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	average use of the improved stove 4 times per week, and the baseline stove 2 times per week, for a total of 6 stove uses per week, or $4/6 = 66\%$ use of improved stove and 34% use of baseline stove. In this case, deployment days was adjusted by 66%.		
	Use of baseline stove		
		Group 1	Group 2
	% of cooking on baseline system in the wet season	38.71%	29.73%
	% of cooking on baseline system in the dry season	33.46%	23.09%
	% MP in Wet Season	67%	67%
	Weighted Average Use of Project Stove	63.03%	72.47%
	For filters, the number of days deployed is discounted by the operational check (fraction of water filters deployed that are being used).Monitoring surveys determined that 72.90% of filters were being actively used by HHs. Note that the operational check for stoves is used to discount N, rather than this parameter.		
QA/QC procedures	-		
Purpose of data	Calculation of baseline emissions.		
Additional comments	-		

Data / Parameter	$N_{y,i,j}$				
Unit	Units				
Description	Number of project devices of type i and batch j operating during year y.				
Measured/Calculated/Default	Measured				
Source of data	Project database				
Value(s) applied	District	Group 1			Group 2 Stoves
		Stoves w/ cross-effects (CE)	Stoves w/o cross-effects (CE)	Filters	
	CPA001 - Rubavu	7,328.89	1,362.01	10,582	6,489.60
	CPA002 - Karongi	10,075.66	1,872.47	14,548	3,827.93
	CPA003 - Ngororero	12,405.50	2,305.45	17,912	4,475.55

	CPA004 - Nyabihu	7,434.16	1,381.57	10,734	2,706.15						
	CPA005 - Nyamasheke	9,670.50	1,797.17	13,963	5,160.54						
	CPA006 - Rutsiro	11,681.76	2,170.95	16,867	5,436.32						
	CPA007 - Rusizi	11,289.06	2,097.97	16,300	6,541.19						
	CPA008 - Bugesera	0	0	0	21,027.37						
	CPA009 - Burera	0	0	0	19,614.69						
	CPA010 - Gatsibo	0	0	0	19,380.72						
	CPA011 - Rulindo	0	0	0	13,402.64						
	CPA012 - Kayanza	0	0	0	11,915.24						
	CPA013 - Kirehe	0	0	0	12,414.30						
	CPA014 - Ngoma	0	0	0	13,802.07						
	CPA015 - Nyagatare	0	0	0	13,988.00						
	CPA016 - Rwamagana	0	0	0	13,490.71						
	Total	79,292	13,610	100,906	173,673.04						
Monitoring Equipment	Distribution records & surveys										
Measuring/reading/recording frequency	Measured Directly										
Calculation Method	For stoves, the number of project devices is calculated as the number of technologies distributed (obtained from the database), discounted by the Operational check. The operational check parameter is determined during monitoring surveys, as the percentage of technologies that are present in the household (specifically, surveyors observe whether technologies are present in the household; if the technologies are present, the operational check is 1, if the technology is not present, the operational check is 0. Users are separately asked about frequency of use, and the number of days that technologies could not be used because they needed repair, but these questions do not impact the Operational Check parameter; instead they determine other parameter values, including the % of cooking on baseline system in the wet season/dry season and $\mu_{y,ij}$. Stoves within Group 1 HHs were also separated to account for cross-effects, as described below. The number of stoves distributed is as follows: <table><tr><td>District</td><td>Group 1</td><td>Group 2</td></tr><tr><td>CPA001 - Rubavu</td><td>10,582</td><td></td></tr></table>					District	Group 1	Group 2	CPA001 - Rubavu	10,582	
District	Group 1	Group 2									
CPA001 - Rubavu	10,582										

			7,295	
	CPA002 - Karongi	14,548	4,303	
	CPA003 - Ngororero	17,912	5,031	
	CPA004 - Nyabihu	10,734	3,042	
	CPA005 - Nyamasheke	13,963	5,801	
	CPA006 - Rutsiro	16,867	6,111	
	CPA007 - Rusizi	16,300	7,353	
	CPA008 - Bugesera	0	23,637	
	CPA009 - Burera	0	22,049	
	CPA010 - Gatsibo	0	21,786	
	CPA011 - Rulindo	0	15,066	
	CPA012 - Kayonza	0	13,394	
	CPA013 - Kirehe	0	13,955	
	CPA014 - Ngoma	0	15,515	
	CPA015 - Nyagatare	0	15,724	
	CPA016 - Rwamagana	0	15,165	
	Total	100906	195,227	
Surveys determined the Operational Check to be 93.64% for Group 2 stoves, and so the number of stoves distributed was discounted by 93.64%. For Group 1 stoves, the Operational Check was 86.45% for Group 1 stoves, and 72.90% for filters. Cross-effects are accounted for in the 72.90% of HHs where the stove and filter were both present. Cross-effects is not considered in the remaining 13.50% (86.45%-72.90%) of stoves in HHs that no longer had a filter. For filters, N is the number of filters distributed, based on distribution records in the database. The operational check is used to discount $\mu_{y,i,j}$ (the number of days of utilization), and so does not affect N.				
QA/QC procedures	N/A			
Purpose of data	Calculation of baseline and project emissions.			
Additional comments	-			

Data / Parameter	HH _{size}
Unit	# of people

Description	Number of persons that utilize each of the functional project appliances
Measured/calculated/default	Measured
Source of data	Household surveys
Value(s) applied	For Group 1 4.60 occupants For Group 2 4.39 occupants
Monitoring equipment	Survey results recorded on smart-phone
Measuring/reading/recording frequency	Annual
Calculation method (if applicable)	Average value of all HHs that have operational products, as determined via self-reported surveys
QA/QC procedures	Please reference section B.2 for the detailed sampling plan.
Purpose of data	Calculation of baseline emissions.
Additional comments	For AMS-II.G, this parameter is multiplied by the average per capita quantity of biomass used in the absence of the project activity (see parameter Bold,PP under the description of Bold) to determine Bold. According to AMS-III.AV, the ex-ante value of HHsize is typically multiplied by the number of households targeted to determine the population serviced by the project equipment (paragraph 18(a) in AMS-III.AV). Following CPA inclusion, this parameter is required to be monitored biennially, and only for Case 2 populations. However, this parameter is necessary to adjust biomass consumption for cross-effects under this PoA. Therefore, this parameter is monitored for all CPAs on an annual basis. As this is conservative relative to the methodological requirements, it is deemed acceptable. The total quantity of purified water (QPWy) shall be divided by HHsize, to determine QPWPP., which is used to adjust biomass consumption to account for cross-effects as described in Section F.1.

Data / Parameter	Baseline System (BS)
Unit	Fraction
Description	Fraction of population for which the baseline fuel displaced is biomass
Measured/calculated/default	Measured
Source of data	Household surveys
Value(s) applied	For Group 1 98.39% For Group 2 99.13 %
Monitoring equipment	Verification survey results recorded on smart-phone
Measuring/reading/recording frequency	According to the registered monitoring plan, this parameter is recorded at initial distribution and then confirmed during first household visit. These records suggest that 100% of HHs utilize

	biomass. In addition, the CME included this question in the monitoring surveys. The monitoring surveys suggest that this value is 98.39% from Group 1 and 99.13% for Group 2. As the staff who conducted the monitoring survey received more extensive training, and since these results are more conservative, the results of the monitoring survey are applied for this verification.
Calculation method (if applicable)	Surveys were conducted according to the approved sampling plan.
QA/QC procedures	Please reference section E.3 for the detailed sampling plan
Purpose of data	Calculation of baseline emissions
Additional comments	Emission reductions were discounted by the fraction of the population that does not use biomass.

Parameters used exclusively for III.AV

Data / Parameter	QPW _y
Unit	Litres
Description	Quantity of purified water in year y
Measured/calculated/default	Calculated from measured parameters
Source of data	Household survey
Value(s) applied	For Group 1 2,022.75 litres/year/HH
Monitoring equipment	Verification survey results recorded on smart-phone
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	Self-reported surveys were administered, according to the sampling plan discussed in section E.3. Survey respondents are asked how much water is filtered per day in the wet and dry season. Filtered water used for purposes other than drinking (such as handwashing or other purposes) is removed, so that QPW includes only filtered drinking water. Verification surveys determined QPW per HH per day to be 6.54 litres/HH/day in the dry season and 5.05 litres/HH/day in the wet season. Based on the percent of the monitoring period in the wet season (67%), the average litres/year/HH is 2022.75. As stated in AMS-III.AV, this value shall not exceed the equivalent of 5.5 litres/person/day. Based on average Group 1 household size (4.83 people), the weighted average litres/pp/day is 1.22. This value is checked manually to ensure that it does not exceed 5.5 l/p/d.

QA/QC procedures	Please reference section E.3 for the detailed sampling plan The outlier analysis was conducted on litres/person/day (which is used to calculate QPW _y); if this value exceeded 5 l/p/d, the datapoint was considered an outlier and removed from the dataset.
Purpose of data	Calculation of baseline emissions
Additional comments	This parameter is only relevant for Group 1 HHs. QPW _y was divided by the total number of persons that are supplied with purified water (see monitored parameter HH _{size}), to determine QPW _{PP} , which is used to adjust biomass consumption to account for cross-effects as described in Section F.1.

Data / Parameter	Water Quality Monitoring
Unit	Fraction
Description	Fraction of LifeStraw® Family units that are in compliance with the water quality requirements of the methodology.
Measured/calculated/default	Measured
Source of data	See temporary deviation in C.3.1. Water quality was not properly monitored during this monitoring period, and therefore emission reductions from water filters are not claimed during this period.
Value(s) applied	0
Monitoring Equipment	See temporary deviation in C.3.1. Water quality was not properly monitored during this monitoring period, and therefore emission reductions from water filters are not claimed during this period.
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	See temporary deviation in C.3.1. Water quality was not properly monitored during this monitoring period, and therefore emission reductions from water filters are not claimed during this period.
QA/QC procedures	See temporary deviation in C.3.1. Water quality was not properly monitored during this monitoring period, and therefore emission reductions from water filters are not claimed during this period.
Purpose of data	Calculation of baseline emissions
Additional comments	See temporary deviation in C.3.1. Water quality was not properly monitored during this monitoring period, and therefore emission reductions from water filters are not claimed during this period.

Data / Parameter	SDW _{frac}
Unit	Fraction
Description	Proportion of CPA population served by a public distribution network of safe drinking water. The CPA total project area is defined by the project proponent to be households within a delineated geographical boundary within a country, minus those households that have running water within their households. Surveys will establish the proportion of households that have running water, and are therefore excluded from the total CPA project area.
Measured/calculated/default	Measured
Source of data	Household surveys determine the fraction of the population within district who have access to running water in homes. These households were excluded from carbon credit calculations associated with the water filters.
Value(s) applied	For Group 1 2.55 %
Monitoring equipment	Verification survey results recorded on smart-phone
Measuring/reading/recording frequency	Annual
Calculation method (if applicable)	Self-reported surveys were administered accordance with the sampling plan described in Section E.3
QA/QC procedures	Surveys followed the sampling plan described in Section E.3.
Purpose of data	Calculation of baseline emissions
Additional comments	This parameter is only relevant for Group 1 HHs. In case the SDW is made available through the public distribution network, no claim for emission reductions can be made for that proportion of the CPA area.

Parameters used exclusively for II.G

Data / Parameter	$\eta_{\text{new},i,j}$																				
Unit	Fraction																				
Description	Efficiency of the device of each type <i>i</i> and batch <i>j</i> implemented as part of the project activity.																				
Measured/calculated/default	Calculated																				
Source of data	Efficiency value was certified by the Centre for Research in Energy and Energy Conservation (CREEC), an agent recognized by Rwanda's national standards body.																				
Value(s) applied	For Group 1 45.0% For Group 2 44.98%																				
Monitoring equipment	Tests conducted by 3 rd party lab recognized by Rwanda's national standards body																				
Measuring/reading/recording frequency	Annually																				
Calculation method (if applicable)	Group 1 stoves were submitted for testing by CREEC, and these results were applied to both Group 1 and Group 2 for this monitoring period. Since Group 2 stoves had been in the field less than two years at the end of this monitoring period, this is conservative. Sample size calculations used results from monitoring period 2, instead of monitoring period 3. This was because monitoring period 3 results did not meet CDM standards, and were being revised following an incompleteness message for monitoring period 3. These calculations determined that less than 1 stove with pot skirt should be tested, and 1.3 stoves without pot skirt should be tested. Delagua randomly selected 5 stoves from Group 1 households in the PoA database, and then retrieved these stoves from households and delivered them to CREEC. Households whose stoves were selected for sampling were provided with new stoves. CREEC conducted 2 tests without pot skirt and 4 tests with pot skirt. The tests with pot skirt determined average efficiency to be 45.2%. The tests of stoves without a pot skirt determined the average efficiency to be 38.6%. The combined results are as follows: <table border="1"> <thead> <tr> <th></th><th colspan="2">Group 1</th><th colspan="2">Group 2</th></tr> <tr> <th></th><th>Stove Efficiency, based on water boiling test results</th><th>% Usage (Monitoring Survey)</th><th>Stove Efficiency, based on water boiling test results</th><th>% Usage (Monitoring Survey)</th></tr> </thead> <tbody> <tr> <td>w/ Pot Skirt*</td><td>45.2%</td><td>96.91%</td><td>45.2%</td><td>96.62%</td></tr> <tr> <td>w/o Pot Skirt*</td><td>38.6%</td><td>3.09%</td><td>38.6%</td><td>3.38%</td></tr> </tbody> </table>		Group 1		Group 2			Stove Efficiency, based on water boiling test results	% Usage (Monitoring Survey)	Stove Efficiency, based on water boiling test results	% Usage (Monitoring Survey)	w/ Pot Skirt*	45.2%	96.91%	45.2%	96.62%	w/o Pot Skirt*	38.6%	3.09%	38.6%	3.38%
	Group 1		Group 2																		
	Stove Efficiency, based on water boiling test results	% Usage (Monitoring Survey)	Stove Efficiency, based on water boiling test results	% Usage (Monitoring Survey)																	
w/ Pot Skirt*	45.2%	96.91%	45.2%	96.62%																	
w/o Pot Skirt*	38.6%	3.09%	38.6%	3.38%																	

	Pot Skirt usage is estimated for Dura users only. Results from non-Dura users (households that indicate they never use the Dura) are excluded from this calculation. Results from non-Dura users are instead used to determine the % of cooking done on the baseline stove in the wet/dry season. Based on the above values, the weighted average efficiency value is 45.0% for group 1 stoves, and 44.98% for group 2 stoves.
QA/QC procedures	Efficiency tests were conducted by CREEC, an approved agent Usage rates were determined by sampling, following the QA/QC procedures in the approved monitoring plan.
Purpose of data	Calculation of project emissions
Additional comments	-

Data / Parameter	Life Span
Unit	Number of Years
Description	The operating lifetime of the project device. The life span should be reported in cases where the PPs are opting to account the efficiency loss as per paragraph 22 of AMS-II.G..
Measured/calculated/ default	Default
Source of data	Manufacturer
Value(s) applied	6-7 years
Monitoring equipment	Manufacturer estimates
Measuring/reading/recording frequency	Only the Dura has been distributed under this PoA. This stove has an expected life span of 6-7 years. The actual life span is monitored annually, via water boiling tests, to ensure that stove efficiency exceeds 20%.
Calculation method (if applicable)	-
QA/QC procedures	-
Purpose of data	Calculation of emission reductions.
Additional comments	A temporary deviation was applied to this parameter. See section C.3.1 for a description. If the life span of devices is less than the crediting period it shall be demonstrated that the devices shall be replaced after the life span has ended. No technology has reached the end of its operational lifespan. The operational lifetime of each stove is expected to be 6-7 years. The oldest stoves distributed under this PoA were approximately 3 years old at the end of this monitoring period (Group 1 stoves were distributed in late 2014). Efficiency tests on these stoves found that the average efficiency has not dropped below 20%, as described under

parameter $\eta_{new,i,j}$.

Each water filter is expected to filter up to 18,000 litres of water over its operational lifetime⁶. To date, the total litres of water filtered per filter is 7,576.93 litres, as shown in the table below.

Table 3: Total litres of Water Filtered

MP#	Days In MP	Avg HH Size	L/P/D	litres
1	198	4.77	1.5	1,416.69
2	167	4.6	1.55	1,190.71
3	419	4.83	1.31	2,651.13
4	420	4.60	1.2	2,318.40
Total Water Filtered				7,576.93

Data / Parameter	Date of commissioning of batch j																																																					
Unit	Date																																																					
Description	Date of distribution																																																					
Measured/calculated/default	Recorded at time of distribution																																																					
Source of data	Internal records																																																					
Value(s) applied	Since the project records the date of distribution of every device, the average distribution date for each CPA is used. The average distribution date for each Group is reported below: <table><tr><td>CPA</td><td>Group 1</td><td>Group 2</td></tr><tr><td>CPA001</td><td>04/11/14</td><td>15/07/16</td></tr><tr><td>CPA002</td><td>12/11/14</td><td>29/07/16</td></tr><tr><td>CPA003</td><td>09/11/14</td><td>19/07/16</td></tr><tr><td>CPA004</td><td>11/11/14</td><td>01/08/16</td></tr><tr><td>CPA005</td><td>17/11/14</td><td>25/07/16</td></tr><tr><td>CPA006</td><td>09/11/14</td><td>24/06/16</td></tr><tr><td>CPA007</td><td>12/11/14</td><td>05/09/16</td></tr><tr><td>CPA008</td><td>-</td><td>13/07/16</td></tr><tr><td>CPA009</td><td>-</td><td>26/07/16</td></tr><tr><td>CPA010</td><td>-</td><td>23/06/16</td></tr><tr><td>CPA011</td><td>-</td><td>08/08/16</td></tr><tr><td>CPA012</td><td>-</td><td>02/06/16</td></tr><tr><td>CPA013</td><td>-</td><td>15/06/16</td></tr><tr><td>CPA014</td><td>-</td><td>18/06/16</td></tr><tr><td>CPA015</td><td>-</td><td>12/06/16</td></tr><tr><td>CPA016</td><td>-</td><td>17/06/16</td></tr></table>			CPA	Group 1	Group 2	CPA001	04/11/14	15/07/16	CPA002	12/11/14	29/07/16	CPA003	09/11/14	19/07/16	CPA004	11/11/14	01/08/16	CPA005	17/11/14	25/07/16	CPA006	09/11/14	24/06/16	CPA007	12/11/14	05/09/16	CPA008	-	13/07/16	CPA009	-	26/07/16	CPA010	-	23/06/16	CPA011	-	08/08/16	CPA012	-	02/06/16	CPA013	-	15/06/16	CPA014	-	18/06/16	CPA015	-	12/06/16	CPA016	-	17/06/16
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Monitoring Equipment	Recorded during distribution of each device, using smartphones																																																					
Monitoring frequency	Fixed and recorded at the time of commissioning/distribution of each device																																																					
Calculation method (if	-																																																					

⁶ Clasen, T. *et al.* 2009. Laboratory assessment of a gravity-fed ultrafiltration water treatment device designed for household use in low-income settings. *Am. J. Trop. Med. Hyg.*, 80(5), 2009, pp. 819–823”.

applicable)	
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	To be reported in the monitoring report Relevant for cookstove technologies only (not water filters)

Data / Parameter	Date of commissioning of project stove device i																																																					
Unit	Date																																																					
Description	Actual date of commissioning of the project device.																																																					
Measured/calculated/default	Recorded at time of distribution																																																					
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Calculation method (if applicable)	-																																																					
QA/QC procedures	-																																																					
Purpose of data	Calculation of baseline emissions																																																					
Additional comments	To be reported in the monitoring report																																																					
	Relevant for cookstove technologies only (not water filters)																																																					

The following parameters were not included in this monitoring report because they were not applicable to the situation in each CPA:

- EF_{projected_kerosene} – Kerosene was not a displaced baseline fuel, and so this parameter is not included.
- LEC_y – Charcoal & briquettes were not used by the project technologies during this monitoring period
- B_{new-KPT,i,j,ce} - This parameter is monitored if B_{y,savings,i,j,ce} is calculated by kitchen performance test. Instead WBTs were used to determine B_{y,savings,i,j,ce}.
- B_{y=1,new,i,j,survey,ce} - This parameter is only monitored if B_{y,savings,i,j,ce} is calculated according to option 2- Equation 8 in the PoA. This equation was not used.

E.3. Implementation of sampling plan

>>

Given the duration of the monitoring period, three rounds of monitoring surveys were conducted. This section presents the description of the second round of monitoring surveys. Other survey rounds are described in the appendix.

A single sampling plan was implemented for each Group in the PoA, as described above.

a. Objectives and Reliability Requirement

The objective for each parameter is defined in the tables below. A single sampling plan was implemented for all CPAs, and therefore the results for each parameter must meet 95/10 confidence/precision.

b. Target Population & Sampling Frame

The target population is the end-users who receive project technologies under a CPA within the PoA, and that share the characteristics outline below. As described in section F, end-users fell into two groups, and so the target population is adjusted accordingly.

-Region

1. For Group 1: Beneficiary HHs were located in the 7 districts of Rwanda's Western Province
2. For Group 2: Beneficiary HHs were located in all CPAs

-Combination of project technology.

1. For Group 1: All beneficiary HHs received a stove and a filter
2. For Group 2: All beneficiary HHs received a stove

-Model of project technology

1. For Group 1: All beneficiary HHs received a Vestergaard Lifestraw Family, 2.0, and a Dura cookstove.
2. For Group 2: All beneficiary HHs received a Dura cookstove

-Installation year (by technology)

1. For Group 1: All technologies were installed between 15 September 2014 and 12 December 2014
2. For Group 2: All technologies were installed between 15 January 2016 and 1 December 2016

As described in section C.1, Group 1 and Group 2 are not equivalent to batches. DelAgua does not separate end-users into batches, as it records the distribution date of every individual technology.

-Target group

1. All technologies were distributed to households

-Socioeconomic level

1.All technologies were distributed to Ubedehe 1 & 2 households.

As the beneficiary HHs share the above characteristics, the project population for each Group is homogenous and the sampling frame is the full list of households in each Group within the PoA database.

c.Sampling Method

Simple random sampling was utilized within each Group.

d.Sample Size

In accordance with the *Standard for sampling and surveys for CDM project activities and programme of activities*, the sample size was chosen to meet the required reliability (95/10 confidence/precision, as the sampling plan covers a group of CPAs).

The sample size for stove efficiency tests was calculated separately from those parameters monitored via survey. These calculations are discussed under the parameter $\eta_{\text{new},i,j}$ above.

For parameters monitored via survey, sample sizes were estimated for each parameter using survey results from the previous monitoring period. Sample sizes were calculated for each surveyed parameter using simple random sampling. With the exception of the parameter 'number of days that stoves are not working', ex-ante calculations determined that 207 surveys would need to be conducted for Group 1 and 138 surveys would need to be conducted for Group 2 (note that this excludes the estimate for 'number of days that stoves are not working', which is discussed in the paragraph below). DelAgua actually conducted 657 surveys; 346 in Group 2 HHs and 311 in Group 1 HHs. The outlier analysis was conducted on these surveys and is discussed below.

Survey size estimates for the parameter 'number of days that stoves are not working' suggested that nearly 8,329 verification surveys would be needed to achieve the required confidence/precision. Given the large sample size, this parameter was monitored through CHW HH visits. A HH visit is when CHWs revisit all households in the PoA, to reinforce key health messaging and collect feedback on technology performance. During this visit, CHWs determine the number of days that stoves/filters were not operational (either because the devices are no longer in the household, or because the stoves/filters were damaged and could not function). Therefore, DelAgua utilized the HH visit surveys to determine both 'number of days that stoves are not working'. Since the parameter 'number of days that filters are not working' is also determined through CHW surveys, the CHW surveys were used to measure this parameter to maintain consistency between similar parameters (sample size estimates for 'number of days that filters are not working' suggested that 69 surveys would be necessary).

This is conservative for two reasons. First, these visits were conducted approximately 6-9 months after the end of this reporting period; since the technologies have been in the field longer, they are more likely to have problems that render them inoperable, increasing the number of days that the technology was not working, and decreasing emission reductions. Second, the CHW HH visits surveyed nearly 90% of Group 1, and over 80% of Group 2 households, and therefore the results are more reliable than verification surveys that reach only a fraction of all households.

Sample size calculations are provided to the DOE for review.

e.Sampling Frame

The sampling frame for each Group is the portion of the population that shares the key characteristics described above in section b, and is selected from the PoA level

database. Samples were selected using a random number generator in Excel. Records of the sampling frame will be maintained for a period of 2 years after the lifetime of the PoA.

Data:

f. Field Measurements

Parameters that were measured via surveys are identified in section G above. All surveyed parameters are measured via in-person survey. A single survey was developed to address all monitored parameters, though the survey administered to Group 2 HHs excluded the filter-related questions (the stove-related questions were identical for Group 1 and Group 2 HHs). Survey questions are made available to the DOE for review.

g. QA/QC

The data collected during monitoring is verified and controlled in the following way:

- Verification surveys were conducted between 18/6/2018 and 24/9/2018.
A training was held on 13/6/2018 and included a review of the survey questions and general communication skills. All surveyors participated in the training, and all were trained on the full survey (including stove and filter questions) but were informed that the filter questions were not administered in Group 2 HHs. Participants practiced conducting interviews in group works (with newer staff paired with experienced surveyors). All surveyors were provided with a printout of the verification survey and training notes, that highlighted the revisions to the survey. Records of the trainings are available to the DOE.
- HH Visit surveys were conducted between 15/5/2018 and 1/11/2018. CHWs conducted visits within their sector and were trained by DelAgua District Managers prior to visit commencement. District Managers evaluated each CHW at the completion of training, and only CHWs that received a satisfactory evaluation could conduct HH visits.
- All ex-ante and monitored data parameters were collected on smart-phone based surveys, and surveys are uniform across all surveyors.
- Unknown to the surveyors, the database analysis includes verification of “valid” surveys including by a.) verifying household consent is received and b.) that the survey duration, as recorded by Internet time, is no shorter or longer than a reasonable value.
- Data validation is conducted on the database to ensure that values are numerically consistent, i.e. multiple-choice values add up to 100% of respondents.

Data was downloaded from the PoA database and assessed for outliers. A data point was considered an outlier if it was more than 1.5 times the inner quartile range. Datapoints identified as outliers were removed from the dataset, with the exception of the following surveyed parameters:

- The number of days that stoves are not working and the number of days that filters are not working. As described below, surveys to determine these parameters were conducted nearly a year after the end of the monitoring period. Since technologies have been operating longer, it would be expected that they would have more maintenance issues that could reduce usage. Therefore, to be conservative, we did not remove outliers for these surveyed parameters. The two surveyed parameters are used to calculate the Operating Fraction for stoves and filters, respectively.
- Pot skirt usage. This value can reasonably be expected to fluctuate between 0%-100%, based on household usage patterns, and therefore results were not limited to the inner quartile range. Instead, datapoints were only removed due to data entry errors, or to exclude households that did not use the Dura stove (pot skirt usage is only recorded for Dura users).

- Quantity of Purified Water – The outlier analysis was conducted on litres/person/day; if this value exceeded 5 l/p/d, the datapoint was considered an outlier and removed from the dataset.
- The number of days that a filter/stove was not operational was limited to the duration of the monitoring period.

The number of outliers removed per parameter is as follows:

Parameter	Group 1	Group 2
Operational Check (filters)	0	NA
Operational Check (stoves)	0	0
Average HH Size	95	2
Fraction of population for which baseline fuel is biomass	0	0
Total Quantity of purified water per day - during the dry season	102	NA
Total Quantity of purified water per day - during the wet season	100	NA
Proportion of population served by a public distribution network of safe drinking water	0	NA
Fraction of total cooking that continues to be done on the baseline stove in the project scenario - during the dry season	0	0
Fraction of total cooking that continues to be done on the baseline stove in the project scenario - during the wet season	0	0
Pot skirt usage (% of cooking done with pot skirt)	53	32
Number of Days Filter is not in working order	0	0
Number of Days Stove is not in working order	0	0
% of population that reboils water after filtering	0	NA

As described above, CHW surveys were used to monitor the parameters ‘number of days that stoves are not working’ and ‘number of days that filters are not working’. These surveys were conducted between July 2018 and October 1, 2018. Teams of 11 CHWs were selected in each sector by DelAgua district managers and were invited to a one-day classroom training. Typically, the CHWs had already worked with DelAgua and were familiar with the program. In cases where a CHW was not available to return, the district manager interviewed additional CHWs and invited them to the training. Following the training, CHWs administered surveys to all households in their sector. The district manager evaluated all CHWs upon completion of the training (and prior to CHWs administering surveys) across several variables, including command of the smart phone (used to collect survey information), ability to communicate, preparedness, program knowledge and general attitude; if a CHW did not achieve a 75% score, then the district manager accompanied the CHW on the first surveys to deliver additional support. District managers revisited at least 2 households surveyed by each CHW, to assess the effectiveness of the survey administered by the CHW. CHWs administered surveys to 90,369 Group 1 households (approximately

90% of all Group 1 households), and 156,362 Group 2 households (approximately 80% of all Group 2 households).

As demonstrated in the table above, all survey results were valid (no outliers were identified). Since these visits were conducted approximately two years after the end of this reporting period, they are more likely to have problems that render them inoperable, increasing the number of days that the technology was not working, and decreasing emission reductions.

The dataset is provided to the DOE for review.

SECTION F. Calculation of emission reductions or net anthropogenic removals

F.1. Calculation of baseline emissions or baseline net removals

>>

$$ER_y = \sum_i \sum_j ER_{y,i,j} - LEC_y - LE_y \quad \text{EQUATION (5)}$$

Where:

i	Indices for the situation where more than one type of project device is introduced to replace the pre-project devices
j	Indices for the situation where there is more than one batch of project device
ER_y	Emission reductions during year y in t CO ₂ e
$ER_{y,i,j}$	Emission reductions by project device of type i and batch j during year y in t CO ₂ e
LEC_y	Leakage emissions from charcoal production in year y

EQUATION

$$ER_{y,i,j} = (B_{y,savings,i,j,ce} \times N_{y,i,j,ce} \times LF) \times \frac{\mu_{y,i,j}}{365} \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected_fossil_fuel} \quad (6)$$

Where:

ce	= Index to identify whether cross-effects is accounted for (ce= 1 if cross-effects is accounted for; ce=0 otherwise)
$B_{y,savings,i,j,ce}$	= Quantity of woody biomass that is saved in tonnes per cook stove device of type i and batch j during year y
$f_{NRB,y}$	= Fraction of woody biomass that can be established as non-renewable biomass using survey methods or government data or default country specific fraction of non-renewable woody biomass (f_{NRB}) values available on the CDM website.
$NCV_{biomass}$	= Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne, based on the gross weight of the wood that is 'air-dried')

$EF_{\text{projected fossil fuel}}$	=	Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 t CO ₂ /TJ
$N_{y,i,ce}$	=	Number of project devices of type <i>i</i> and batch <i>j</i> operating during year <i>y</i> ,
$\mu_{y,i}$	=	Number of days of utilization of the project device <i>i</i> and batch <i>j</i> during the year <i>y</i> .
LF	=	Leakage factor, to account for increase in NRB use outside the project boundary

Note that equation 2 in AMS-II.G(v7),), which corresponds to equation 6 above, does not include the *ce* parameter. As cookstoves and water filters may be distributed/in-operation together as a result of this program, this parameter was added to the calculations in this PoA to ensure that emission reductions are appropriately adjusted to account for cross-effects.

This CPA will determine $B_{y,savings,i,j,ce}$ following Option 2 (water boiling test), as described here:

$$B_{y,savings,i,j,ce} = B_{old,i,j,ce} \times \left(1 - \frac{\eta_{old,i,j}}{\eta_{new,i,j}}\right) \quad \text{EQUATION (8)}$$

F.2. Calculation of project emissions or actual net removals

>>

AMS-II.G describes the calculation of emission reductions and does not require estimation of project emissions separately from baseline emissions. The emission reduction calculation methodology is described in section F.1 above.

The emission reduction calculation methodology for AMS-III.AV is described in section F.1 as well.

F.3. Calculation of leakage emissions

>>

As established in the monitoring plan, leakage is accounted for through the application of a net to gross adjustment factor of 0.95. According to AMS-II.G, this adjustment factor is applied to $B_{y,savings,i,j,ce}$ (see Equation 6 in section F.1), and so is factored into the stove-related baseline emissions calculations in the tables in section F.4.

F.4. Calculation of emission reductions or net anthropogenic removals

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO ₂ e)	Project GHG emissions or actual net GHG removals (t CO ₂ e)	Leakage GHG emissions (t CO ₂ e)	GHG emission reductions or net anthropogenic GHG removals (t CO ₂ e)		
				Before 01/01/2013	From 01/01/2013	Total amount
CPA001	60,490	-	-	-	60,490	60,490
CPA002	64,213	-	-	-	64,213	64,213
CPA003	78,397	-	-	-	78,397	78,397

CPA004	46,969	-	-	-	46,969	46,969
CPA005	67,092	-	-	-	67,092	67,092
CPA006	78,880	-	-	-	78,880	78,880
CPA007	79,054	-	-	-	79,054	79,054
CPA008	77,454	-	-	-	77,454	77,454
CPA009	71,163	-	-	-	71,163	71,163
CPA010	73,081	-	-	-	73,081	73,081
CPA011	47,872	-	-	-	47,872	47,872
CPA012	46,010	-	-	-	46,010	46,010
CPA013	47,230	-	-	-	47,230	47,230
CPA014	52,340	-	-	-	52,340	52,340
CPA015	53,410	-	-	-	53,410	53,410
CPA016	51,220	-	-	-	51,220	51,220
Total	994,875	-	-	-	994,875	994,875

F.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the included CPA-DDs

CPA UNFCCC reference number	Amount achieved during this monitoring period (t CO ₂ e)	Amount estimated ex ante for this monitoring period in the CPA-DD (t CO ₂ e)
CPA001	170,122	60,490
CPA002	66,979	64,213
CPA003	83,776	78,397
CPA004	48,945	46,969
CPA005	63,723	67,092
CPA006	82,397	78,880
CPA007	74,342	79,054
CPA008	99,503	77,454
CPA009	91,992	71,163
CPA010	88,693	73,081
CPA011	71,342	47,872
CPA012	55,825	46,010
CPA013	57,216	47,230
CPA014	65,634	52,340
CPA015	63,662	53,410
CPA016	63,653	51,220
Total	1,247,817	994,875

F.5.1. Explanation of calculation of “amount estimated ex ante for this monitoring period in the CPA-DD”

>>

Ex ante estimates are based on pilot surveys conducted at the time of PoA registration.

F.6. Remarks on increase in achieved emission reductions

>>

Remarks on The actual emission reductions achieved during the monitoring period are less than anticipated in the registered CPA-DDs. This is due to the following factors:

1. The average HH size was estimated to be 5.41 in the CPA-DDs. The actual monitored value was 4.60 occupants for Group 1, and 4.39 for Group 2 HHs.
2. Stove stacking (continued usage of baseline stove in the project scenario) was larger than anticipated in the CPA-DD. The registered value was 0%, compared to a monitored value of 36.97% for group 1, and 27.53% for group 2.
3. The baseline stove efficiency estimated in the registered CPA-DDs was 10%. Updated surveys (required with the post-registration change to the PoA) determined the baseline stove efficiency to be 10.26%.

F.7. Remarks on scale of small-scale CPAs

>>

As demonstrated in emission reduction calculation workbooks, the maximum number of stoves that can be distributed under a Group 1 CPA while respecting the small-scale CPA threshold is 25,611. The maximum number of stoves for a Group 2 CPA is 26,824. All CPAs respected these limits during the monitoring period.

Appendix A: Discussion of first set of monitoring surveys

Data and parameters monitored

Parameters common to III.AV and II.G

Data / Parameter	η_{wb} ; η_{old}
Unit	%
Description	Efficiency of pre - project device. If the device is a three stone fire using firewood (not charcoal) , or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney, a default value of 0.1 is used as per the applied methodology; a value of 0.5 is used for fossil fuel combustion systems, and a default value of 0.2 is used for other types of devices. Use weighted average values (taking the amount of woody biomass consumed by each device as the weighting factor) if more than one type of device is being replaced
Measured/calculated/ default	Measured, using surveyed data and default values.
Source of data	Default value for stove efficiency combined with surveys of Group 1 and Group 2 households to determine the type of baseline device used in households and the amount of woody biomass consumed by each device.
Value(s) of monitored parameter	10.26% (for Group 1 and Group 2)
Monitoring equipment	Sampling was conducted in accordance with the sampling plan outlined in section B.7.2.
Measuring/reading/recording frequency	This parameter is determined during technology distribution, and fixed thereafter.
Calculation method (if applicable)	Households were asked the following questions: (1)What was the predominant baseline stove used prior to the intervention? (2)How many times was it typically used to cook per week. (3)What other types of baseline stoves were used prior to the intervention? (4)For each other stove, how many times was it typically used to cook per week. (5)Did each baseline stoves have a grate or chimney. Based on the stove type and the presence of a grate/chimney, an efficiency value was assigned to each stove. The weighted average efficiency was then calculated based on the number of cooking events per stove.
QA/QC procedures	According to the QA/QC procedures in the registered monitoring plan, an outlier analysis shall be conducted. In this case, the outlier analysis would have removed higher efficiency values associated with improved stoves, resulting in a baseline efficiency of 10%. To ensure that all reasonable results were included in the final result, the outlier analysis was not conducted.
Purpose of data	Calculation of baseline and project emissions.

Additional comments	-
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Data / Parameter	$\mu_{y,i,j}$																																																																								
Unit	Days																																																																								
Description	Number of days of utilization of the project device i and batch j during the year y																																																																								
Source of data	Household Surveys																																																																								
Value(s) applied	<table> <tr> <th></th><th colspan="2">Group 1</th><th>Group 2</th></tr> <tr> <th></th><th>Stove</th><th>Filter</th><th>Stove</th></tr> <tr><td>CPA001</td><td>252.30</td><td>302.88</td><td>76.91</td></tr> <tr><td>CPA002</td><td>252.30</td><td>302.88</td><td>63.53</td></tr> <tr><td>CPA003</td><td>252.30</td><td>302.88</td><td>70.96</td></tr> <tr><td>CPA004</td><td>252.30</td><td>302.88</td><td>67.24</td></tr> <tr><td>CPA005</td><td>252.30</td><td>302.88</td><td>66.50</td></tr> <tr><td>CPA006</td><td>252.30</td><td>302.88</td><td>89.54</td></tr> <tr><td>CPA007</td><td>252.30</td><td>302.88</td><td>37.52</td></tr> <tr><td>CPA008</td><td>252.30</td><td>302.88</td><td>75.42</td></tr> <tr><td>CPA009</td><td>-</td><td>-</td><td>65.76</td></tr> <tr><td>CPA010</td><td>-</td><td>-</td><td>90.28</td></tr> <tr><td>CPA011</td><td>-</td><td>-</td><td>56.10</td></tr> <tr><td>CPA012</td><td>-</td><td>-</td><td>105.89</td></tr> <tr><td>CPA013</td><td>-</td><td>-</td><td>96.23</td></tr> <tr><td>CPA014</td><td>-</td><td>-</td><td>94.00</td></tr> <tr><td>CPA015</td><td>-</td><td>-</td><td>98.46</td></tr> <tr><td>CPA016</td><td>-</td><td>-</td><td>94.74</td></tr> </table>		Group 1		Group 2		Stove	Filter	Stove	CPA001	252.30	302.88	76.91	CPA002	252.30	302.88	63.53	CPA003	252.30	302.88	70.96	CPA004	252.30	302.88	67.24	CPA005	252.30	302.88	66.50	CPA006	252.30	302.88	89.54	CPA007	252.30	302.88	37.52	CPA008	252.30	302.88	75.42	CPA009	-	-	65.76	CPA010	-	-	90.28	CPA011	-	-	56.10	CPA012	-	-	105.89	CPA013	-	-	96.23	CPA014	-	-	94.00	CPA015	-	-	98.46	CPA016	-	-	94.74
	Group 1		Group 2																																																																						
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Monitoring equipment	Surveys																																																																								
Measuring/reading/recording frequency	Annually																																																																								
Calculation method (if applicable)	The number of days that a technology is deployed will be calculated based on the average operating period of all similar technologies within a CPA. The steps to determining the average operating period is as follows: 1. The number of days that technologies are deployed is determined from the PoA database, based on the average distribution date within a CPA. Days Deployed <table> <tr> <th></th><th colspan="2">Group 1</th><th>Group 2</th></tr> <tr> <th></th><th>Stove</th><th>Filter</th><th>Stove</th></tr> <tr><td>CPA001</td><td>419</td><td>366.17</td><td>119</td></tr> <tr><td>CPA002</td><td>419</td><td>366.17</td><td>101</td></tr> <tr><td>CPA003</td><td>419</td><td>366.17</td><td>111</td></tr> <tr><td>CPA004</td><td>419</td><td>366.17</td><td>106</td></tr> <tr><td>CPA005</td><td>419</td><td>366.17</td><td>105</td></tr> <tr><td>CPA006</td><td>419</td><td>366.17</td><td>136</td></tr> <tr><td>CPA007</td><td>419</td><td>366.17</td><td>66</td></tr> <tr><td>CPA008</td><td>419</td><td>366.17</td><td>117</td></tr> <tr><td>CPA009</td><td>-</td><td>-</td><td>104</td></tr> <tr><td>CPA010</td><td>-</td><td>-</td><td>137</td></tr> </table>		Group 1		Group 2		Stove	Filter	Stove	CPA001	419	366.17	119	CPA002	419	366.17	101	CPA003	419	366.17	111	CPA004	419	366.17	106	CPA005	419	366.17	105	CPA006	419	366.17	136	CPA007	419	366.17	66	CPA008	419	366.17	117	CPA009	-	-	104	CPA010	-	-	137																								
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	CPA011	-	-	91								
	CPA012	-	-	158								
	CPA013	-	-	145								
	CPA014	-	-	142								
	CPA015	-	-	148								
	CPA016	-	-	143								
	2. The number of days that stove was not working was determined during HH visits conducted by CHWs (see Section E.3G) Days Stove Not Working <table border="1"> <tr> <th>Group</th> <th>Stove</th> <th>Filter</th> </tr> <tr> <td>Group 1</td> <td>33.54</td> <td>51.86</td> </tr> <tr> <td>Group 2</td> <td>14.52</td> <td>NA</td> </tr> </table> 3. The final step is different for stoves and filters For stoves, the days in the field was discounted by continued usage of the baseline stove. Usage was captured by verification survey questions designed to capture the cooking habits and stove usage of households in the region were conducted. Households were asked as to their frequency of use of the improved stove versus the baseline stove, and the baseline fuel consumption was adjusted on the CPA household level to account for the average continued use of the baseline stove. For example, household surveys in a CPA may have reported a total average use of the improved stove 4 times per week, and the baseline stove 2 times per week, for a total of 6 stove uses per week, or $4/6 = 66\%$ use of improved stove and 34% use of baseline stove. In this case, deployment days was adjusted by 66%.				Group	Stove	Filter	Group 1	33.54	51.86	Group 2	14.52
Group	Stove	Filter										
Group 1	33.54	51.86										
Group 2	14.52	NA										
	Use of baseline stove											
		Group 1	Group 2									
	% of cooking on baseline system in the wet season	34.95%	26.30%									
	% of cooking on baseline system in the dry season	33.20%	24.41%									
	% MP in Wet Season	67%	67%									
	Weighted Average Use of Project Stove	65.63%	74.32%									
For filters, the number of days deployed is discounted by the operational check (fraction of water filters deployed that are being used). Surveys determined that 82.72% of filters were being actively used by HHs. Note that the operational check for stoves is used to discount N, rather than this parameter.												
QA/QC procedures	-											
Purpose of data	Calculation of baseline emissions.											

Additional comments	-
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Data / Parameter	$N_{y,i,j}$				
Unit	Units				
Description	Number of project devices of type i and batch j operating during year y.				
Measured/Calculated/Default	Measured				
Source of data	Project database				
Value(s) applied	District	Group 1			Group 2 Stoves
		Stoves w/ cross-effects (CE)	Stoves w/o cross-effects (CE)	Filters	
	CPA001 - Rubavu	8,315	1,427	10,582	6,572.59
	CPA002 - Karongi	11,432	1,962	14,548	4,035.51
	CPA003 - Ngororero	14,075	2,416	17,912	4,720.44
	CPA004 - Nyabihu	8,435	1,448	10,734	2,751.01
	CPA005 - Nyamasheke	10,972	1,883	13,963	5,442.91
	CPA006 - Rutsiro	13,254	2,275	16,867	5,733.78
	CPA007 - Rusizi	12,809	2,198	16,300	6,688.94
	CPA008 - Bugesera	0	0	0	22,135.70
	CPA009 - Burera	0	0	0	20,687.95
	CPA010 - Gatsibo	0	0	0	20,441.19
	CPA011 - Rulindo	0	0	0	14,136.00
	CPA012 - Kayanza	0	0	0	12,567.21
	CPA013 - Kirehe	0	0	0	13,074.81
	CPA014 - Ngoma	0	0	0	14,555.41
	CPA015 - Nyagatare	0	0	0	14,753.3

					8																																																						
	CPA016 - Rwamagana	0	0	0	14,228.89																																																						
	Total	79,292	13,610	100,906	6,572.59																																																						
Monitoring Equipment	Distribution records & surveys																																																										
Measuring/reading/recording frequency	Measured Directly																																																										
Calculation Method	For stoves, the number of project devices is calculated as the number of technologies distributed (obtained from the database), discounted by the the Operational check (fraction of technologies deployed that are being used). Stoves within Group 1 HHs were also separated to account for cross-effects, as described below. The number of stoves distributed is as follows: <table border="1"> <thead> <tr> <th>District</th><th>Group 1</th><th>Group 2</th></tr> </thead> <tbody> <tr><td>CPA001 - Rubavu</td><td>10,582</td><td>7,005</td></tr> <tr><td>CPA002 - Karongi</td><td>14,548</td><td>4,301</td></tr> <tr><td>CPA003 - Ngororero</td><td>17,912</td><td>5,031</td></tr> <tr><td>CPA004 - Nyabihu</td><td>10,734</td><td>2,932</td></tr> <tr><td>CPA005 - Nyamasheke</td><td>13,963</td><td>5,801</td></tr> <tr><td>CPA006 - Rutsiro</td><td>16,867</td><td>6,111</td></tr> <tr><td>CPA007 - Rusizi</td><td>16,300</td><td>7,129</td></tr> <tr><td>CPA008 - Bugesera</td><td>0</td><td>23,592</td></tr> <tr><td>CPA009 - Burera</td><td>0</td><td>22,049</td></tr> <tr><td>CPA010 - Gatsibo</td><td>0</td><td>21,786</td></tr> <tr><td>CPA011 - Rulindo</td><td>0</td><td>15,066</td></tr> <tr><td>CPA012 - Kayonza</td><td>0</td><td>13,394</td></tr> <tr><td>CPA013 - Kirehe</td><td>0</td><td>13,935</td></tr> <tr><td>CPA014 - Ngoma</td><td>0</td><td>15,513</td></tr> <tr><td>CPA015 - Nyagatare</td><td>0</td><td>15,724</td></tr> <tr><td>CPA016 - Rwamagana</td><td>0</td><td>15,165</td></tr> <tr><td>Total</td><td>100906</td><td>194,534</td></tr> </tbody> </table> Surveys determined the Operational Check to be 98.13% for Group 2 stoves, and so the number of stoves distributed was discounted by 98.13%. For Group 1 stoves, the Operational Check was 96.91% for Group 1 stoves, and 82.72% for filters. Cross-effects are accounted for in the 82.72% of HHs that were found to be using the filter and stove. Cross-effects is not considered in the remaining 14.20% (96.91%-82.72%) of stoves in HHs that do not actively use the filter. For filters, N is the number of filters distributed, based on distribution records in the database. The operational check is used to discount $\mu_{y,ij}$ (the number of days of utilization), and so does not effect N.					District	Group 1	Group 2	CPA001 - Rubavu	10,582	7,005	CPA002 - Karongi	14,548	4,301	CPA003 - Ngororero	17,912	5,031	CPA004 - Nyabihu	10,734	2,932	CPA005 - Nyamasheke	13,963	5,801	CPA006 - Rutsiro	16,867	6,111	CPA007 - Rusizi	16,300	7,129	CPA008 - Bugesera	0	23,592	CPA009 - Burera	0	22,049	CPA010 - Gatsibo	0	21,786	CPA011 - Rulindo	0	15,066	CPA012 - Kayonza	0	13,394	CPA013 - Kirehe	0	13,935	CPA014 - Ngoma	0	15,513	CPA015 - Nyagatare	0	15,724	CPA016 - Rwamagana	0	15,165	Total	100906	194,534
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Total	100906	194,534																																																									

QA/QC procedures	N/A
Purpose of data	Calculation of baseline and project emissions.
Additional comments	-

Data / Parameter	HH _{size}
Unit	# of people
Description	Number of persons that utilize each of the functional project appliances
Measured/calculated/default	Measured
Source of data	Household surveys
Value(s) applied	For Group 1 4.83 occupants For Group 2 4.46 occupants
Monitoring equipment	Survey results recorded on smart-phone
Measuring/reading/recording frequency	Annual
Calculation method (if applicable)	Average value of all HHs that have operational products, as determined via self-reported surveys
QA/QC procedures	Please reference section B.2 for the detailed sampling plan.
Purpose of data	Calculation of baseline emissions.
Additional comments	For AMS-II.G, this parameter is multiplied by the average per capita quantity of biomass used in the absence of the project activity (see parameter B_{old,PP} under the description of B_{old}) to determine B_{old}. According to AMS-III.AV, the ex-ante value of HH_{size} is typically multiplied by the number of households targeted to determine the population serviced by the project equipment (paragraph 18(a) in AMS-III.AV). Following CPA inclusion, this parameter is required to be monitored biennially, and only for Case 2 populations. However, this parameter is necessary to adjust biomass consumption for cross-effects under this PoA. Therefore, this parameter is monitored for all CPAs on an annual basis. As this is conservative relative to the methodological requirements, it is deemed acceptable. The total quantity of purified water (QPW_y) shall be divided by HH_{size}, to determine QPW_{PP}, which is used to adjust biomass consumption to account for cross-effects as described in Section F.1.

Data / Parameter	Baseline System (BS)
Unit	Fraction
Description	Fraction of population for which the baseline fuel displaced is biomass
Measured/calculated/default	Measured
Source of data	Household surveys
Value(s) applied	For Group 1 100% For Group 2 98.13 %
Monitoring equipment	Verification survey results recorded on smart-phone
Measuring/reading/recording frequency	According to the registered monitoring plan, this parameter is recorded at initial distribution and then confirmed during first household visit. These records suggest that 100% of HHs utilize biomass. In addition, the CME included this question in the monitoring surveys. The monitoring surveys suggest that this value is 100% from Group 1 and 98.13% for Group 2. As the staff who conducted the monitoring survey received more extensive training, and since these results are more conservative, the results of the monitoring survey are applied for this verification.
Calculation method (if applicable)	Surveys were conducted according to the approved sampling plan. .
QA/QC procedures	Please reference section E.3 for the detailed sampling plan
Purpose of data	Calculation of baseline emissions
Additional comments	Emission reductions were discounted by the fraction of the population that does not use biomass.

Parameters used exclusively for III.AV

Data / Parameter	QPW _y
Unit	Litres
Description	Quantity of purified water in year y
Measured/calculated/default	Calculated from measured parameters
Source of data	Household survey
Value(s) applied	For Group 1 2,304.63 litres/year/HH
Monitoring equipment	Verification survey results recorded on smart-phone
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	Self-reported surveys were administered, according to the sampling plan discussed in section E.3. Survey respondents are asked how

	much water is filtered per day in the wet and dry season. Filtered water used for purposes other than drinking (such as handwashing or other purposes) is removed, so that QPW includes only filtered drinking water. Verification survey's determined QPW per HH per day to be 7.66 liters/HH/day in the dry season and 5.65 liters/HH/day in the wet season. Based on the percent of the monitoring period in the wet season (67%), the average liters/year/HH is 2304.63. As stated in AMS-III.AV, this value shall not exceed the equivalent of 5.5 litres/person/day. Based on average Group 1 household size (4.83 people), the weighted average liters/pp/day is 1.31. This value is checked manually to ensure that it does not exceed 5.5 l/p/d.
QA/QC procedures	Please reference section E.3 for the detailed sampling plan The outlier analysis was conducted on liters/person/day (which is used to calculate QPW_y); if this value exceeded 5 l/p/d, the datapoint was considered an outlier and removed from the dataset.
Purpose of data	Calculation of baseline emissions
Additional comments	This parameter is only relevant for Group 1 HHs. QPW_y was divided by the total number of persons that are supplied with purified water (see monitored parameter HH_{size}), to determine QPW_{pp}, which is used to adjust biomass consumption to account for cross-effects as described in Section F.1.

Data / Parameter	Water Quality Monitoring
Unit	Fraction
Description	Fraction of LifeStraw® Family units that are in compliance with the water quality requirements of the methodology.
Measured/calculated/default	Default
Source of data	Date of issue of LifeStraw® Family and certificate of quality for associated batch by manufacturer.
Value(s) applied	1
Monitoring Equipment	NA
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	The LifeStraw® Family manufacturer guarantees compliance with EPA standards for microbiological contamination. As designed and produced, the LifeStraw® Family uses size exclusion to ensure that microbiological contamination is not present in treated water. As the filter clogs, the flowrate is reduced. Therefore, a filter at its end-of-life cannot pass water that is untreated. This is a fail-safe indicator of the end-of-life. Therefore, the water quality compliance of this technology is achieved via an annual operational check of the units in place (conducted as part of the determination of $N_{y,i,j}$ for stoves and $\mu_{y,i,j}$ for filters) and ensuring that each shipment of water filters is accompanied with a Certificate of Quality (COQ).

QA/QC procedures	Manufacturer certificate of quality for each batch of LifeStraw® Family units produced: http://www.vestergaard-frandsen.com/lifestraw/lifestraw-family/certificate-of-quality
Purpose of data	Calculation of baseline emissions
Additional comments	This parameter is only relevant for Group 1 HHs. The LifeStraw® Family conforms to US EPA microbiological water quality standards, as allowed by the methodology. Each LifeStraw® Family batch produced is issued a Certificate of Quality by the manufacturer that demonstrates compliance of the batch with EPA standards. An example is shown here: http://www.vestergaard-frandsen.com/lifestraw/lifestraw-family/certificate-of-quality Annual emission reductions shall be discounted by water quality fraction.

Data / Parameter	SDW _{frac}
Unit	Fraction
Description	Proportion of CPA population served by a public distribution network of safe drinking water. The CPA total project area is defined by the project proponent to be households within a delineated geographical boundary within a country, minus those households that have running water within their households. Surveys will establish the proportion of households that have running water, and are therefore excluded from the total CPA project area.
Measured/calculated/default	Measured
Source of data	Household surveys determine the fraction of the population within district who have access to running water in homes. These households were excluded from carbon credit calculations associated with the water filters.
Value(s) applied	For Group 1 0.62 %
Monitoring equipment	Verification survey results recorded on smart-phone
Measuring/reading/recording frequency	Annual
Calculation method (if applicable)	Self-reported surveys were administered accordance with the sampling plan described in Section E.3
QA/QC procedures	Surveys followed the sampling plan described in Section E.3.
Purpose of data	Calculation of baseline emissions
Additional comments	This parameter is only relevant for Group 1 HHs. In case the SDW is made available through the public distribution network, no claim for emission reductions can be made for that proportion of the CPA area.

Parameters used exclusively for II.G

Data / Parameter	$\eta_{\text{new},i,j}$																							
Unit	Fraction																							
Description	Efficiency of the device of each type <i>i</i> and batch <i>j</i> implemented as part of the project activity.																							
Measured/calculated/default	Calculated																							
Source of data	Efficiency value was certified by the Centre for Research in Energy and Energy Conservation (CREEC), an agent recognized by Rwanda's national standards body.																							
Value(s) applied	For Group 1 41.68% For Group 2 41.85%																							
Monitoring equipment	N/A. Tests conducted by 3 rd party lab recognized by Rwanda's national standards body																							
Measuring/reading/recording frequency	Annually																							
Calculation method (if applicable)	A four-year old stove was submitted for testing by CREEC. This testing was conducted in response to an incompleteness message, and it was no longer possible to test stoves of the appropriate vintage. Therefore, the results for the four-year old stove are applied to both Group 1 and Group 2 for this monitoring period. Since Group 2 stoves had been in the field one-year, and Group 1 stoves had been in the field two-years at the end of this monitoring period, this is conservative. Sample size calculations determined that less than 1 stove with pot skirt should be tested, and 1.3 stoves without pot skirt should be tested. Delagua randomly selected 4 stoves from Group 1 households in the PoA database, and then retrieved these stoves from households and delivered them to CREEC. Households whose stoves were selected for sampling were provided with new stoves. CREEC conducted 2 tests without pot skirt and 4 tests with pot skirt. The tests with pot skirt determined stove efficiency to be 45.2%. The tests of stoves without a pot skirt determined the average efficiency to be 38.6%. The combined results are as follows: <table border="1"> <thead> <tr> <th></th><th colspan="2">Group 1</th><th colspan="2">Group 2</th></tr> <tr> <th></th><th>Stove Efficiency, based on water boiling test results</th><th>% Usage (Monitoring Survey)</th><th>Stove Efficiency, based on water boiling test results</th><th>% Usage (Monitoring Survey)</th></tr> </thead> <tbody> <tr> <td>w/ Pot Skirt*</td><td>45.2%</td><td>91.50%</td><td>45.22%</td><td>93.78%</td></tr> <tr> <td>w/o Pot Skirt*</td><td>38.6%</td><td>8.50%</td><td>38.6%</td><td>6.22%</td></tr> </tbody> </table>					Group 1		Group 2			Stove Efficiency, based on water boiling test results	% Usage (Monitoring Survey)	Stove Efficiency, based on water boiling test results	% Usage (Monitoring Survey)	w/ Pot Skirt*	45.2%	91.50%	45.22%	93.78%	w/o Pot Skirt*	38.6%	8.50%	38.6%	6.22%
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w/o Pot Skirt*	38.6%	8.50%	38.6%	6.22%																				

	Based on the above values, the weighted average efficiency value is 44.63% for group 1 stoves, and 44.79% for group 2 stoves.
QA/QC procedures	Efficiency tests were conducted by CREEC, an approved agent Usage rates were determined by sampling, following the QA/QC procedures in the approved monitoring plan.
Purpose of data	Calculation of project emissions
Additional comments	-

Data / Parameter	Life Span
Unit	Number of Years
Description	The operating lifetime of the project device. The life span should be reported in cases where the PPs are opting to account the efficiency loss as per paragraph 22 of AMS-II.G..
Measured/calculated/ default	Default
Source of data	Manufacturer
Value(s) applied	6-7 years
Monitoring equipment	Manufacturer estimates
Measuring/reading/recording frequency	Only the Dura has been distributed under this PoA. This stove has an expected life span of 6-7 years. The actual life span is monitored annually, via water boiling tests, to ensure that stove efficiency exceeds 20%.
Calculation method (if applicable)	-
QA/QC procedures	-
Purpose of data	Calculation of emission reductions.
Additional comments	A temporary deviation was applied to this parameter. See section C.3.1 for a description. If the life span of devices is less than the crediting period it shall be demonstrated that the devices shall be replaced after the life span has ended. No technology has reached the end of its operational lifespan. The operational lifetime of each stove is expected to be 6-7 years. The oldest stoves distributed under this PoA were approximately 2 years old at the end of this monitoring period (Group 1 stoves were distributed in late 2014). Efficiency tests on these stoves found that the average efficiency has not dropped below 20%, as described under parameter $\eta_{\text{new},i,j}$.

Each water filter is expected to filter up to 18,000 liters of water over its operational lifetime⁷. To date, the total liters of water filtered per filter is 4,975.21 liters, as shown in the table below. The 178 filter replacements identified in **Error! Reference source not found.** were not replaced because they had reached the end of their operational lifetime. Instead

Table 4: Total Liters of Water Filtered

MP#	Days In MP	Avg HH Size	L/P/D	Liters
1	198	4.77	1.5	1,416.69
2	167	4.6	1.55	1,190.71
3	419	4.83	1.31	2,651.13
Total Water Filtered				5,258.53

Data / Parameter	Date of commissioning of batch j																																																			
Unit	Date																																																			
Description	Date of distribution																																																			
Measured/calculated/default	Recorded at time of distribution																																																			
Source of data	Internal records																																																			
Value(s) applied	Since the project records the date of distribution of every device, the average distribution date for each CPA is used. The average distribution date for each Group is reported below: <table><tr><td>CPA</td><td>Group 1</td><td>Group 2</td></tr><tr><td>CPA001</td><td>04/11/14</td><td>11/07/16</td></tr><tr><td>CPA002</td><td>12/11/14</td><td>29/07/16</td></tr><tr><td>CPA003</td><td>09/11/14</td><td>19/07/16</td></tr><tr><td>CPA004</td><td>11/11/14</td><td>24/07/16</td></tr><tr><td>CPA005</td><td>17/11/14</td><td>25/07/16</td></tr><tr><td>CPA006</td><td>09/11/14</td><td>24/06/16</td></tr><tr><td>CPA007</td><td>12/11/14</td><td>02/09/16</td></tr><tr><td>CPA008</td><td>-</td><td>13/07/16</td></tr><tr><td>CPA009</td><td>-</td><td>26/07/16</td></tr><tr><td>CPA010</td><td>-</td><td>23/06/16</td></tr><tr><td>CPA011</td><td>-</td><td>08/08/16</td></tr><tr><td>CPA012</td><td>-</td><td>02/06/16</td></tr><tr><td>CPA013</td><td>-</td><td>15/06/16</td></tr><tr><td>CPA014</td><td>-</td><td>18/06/16</td></tr><tr><td>CPA015</td><td>-</td><td>12/06/16</td></tr><tr><td>CPA016</td><td>-</td><td>17/06/16</td></tr></table>	CPA	Group 1	Group 2	CPA001	04/11/14	11/07/16	CPA002	12/11/14	29/07/16	CPA003	09/11/14	19/07/16	CPA004	11/11/14	24/07/16	CPA005	17/11/14	25/07/16	CPA006	09/11/14	24/06/16	CPA007	12/11/14	02/09/16	CPA008	-	13/07/16	CPA009	-	26/07/16	CPA010	-	23/06/16	CPA011	-	08/08/16	CPA012	-	02/06/16	CPA013	-	15/06/16	CPA014	-	18/06/16	CPA015	-	12/06/16	CPA016	-	17/06/16
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⁷ Clasen, T. *et al.* 2009. Laboratory assessment of a gravity-fed ultrafiltration water treatment device designed for household use in low-income settings. *Am. J. Trop. Med. Hyg.*, 80(5), 2009, pp. 819–823”.

Monitoring Equipment	Recorded during distribution of each device, using smartphones
Monitoring frequency	Fixed and recorded at the time of commissioning/distribution of each device
Calculation method (if applicable)	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	To be reported in the monitoring report Relevant for cookstove technologies only (not water filters)

Data / Parameter	Date of commissioning of project stove device i																																																					
Unit	Date																																																					
Description	Actual date of commissioning of the project device.																																																					
Measured/calculated/default	Recorded at time of distribution																																																					
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Additional comments	To be reported in the monitoring report Relevant for cookstove technologies only (not water filters)																																																					

The following parameters were not included in this monitoring report because they were not applicable to the situation in each CPA:

- EF_{projected_kerosene} – Kerosene was not a displaced baseline fuel, and so this parameter is not included.
- LEC_y – Charcoal & briquettes were not used by the project technologies during this monitoring period
- B_{new-KPT,i,j,ce} - This parameter is monitored if B_{y,savings,i,j,ce} is calculated by kitchen performance test. Instead WBTs were used to determine B_{y,savings,i,j,ce}.
- B_{y=1,new,i,j,survey,ce} - This parameter is only monitored if B_{y,savings,i,j,ce} is calculated according to option 2- Equation 8 in the PoA. This equation was not used.

Implementation of sampling plan(s)

>>

A single sampling plan was implemented for each Group in the PoA, as described above.

h.Objectives and Reliability Requirement

The objective for each parameter is defined in the tables below. A single sampling plan was implemented for all CPAs, and therefore the results for each parameter must meet 95/10 confidence/precision.

i.Target Population & Sampling Frame

The target population is the end-users who receive project technologies under a CPA within the PoA, and that share the characteristics outline below. As described in section F, end-users fell into two groups, and so the target population is adjusted accordingly.

-Region

1. For Group 1: Beneficiary HHs were located in the 7 districts of Rwanda's Western Province
2. For Group 2: Beneficiary HHs were located in all CPAs

-Combination of project technology.

1. For Group 1: All beneficiary HHs received a stove and a filter
2. For Group 2: All beneficiary HHs received a stove

-Model of project technology

1. For Group 1: All beneficiary HHs received a Vestergaard Lifestraw Family, 2.0, and a Dura coosktove.
2. For Group 2: All beneficiary HHs received a Dura cookstove

-Installation year (by technology)

1. For Group 1: All technologies were installed between 15 September, 2014 and 12 December, 2014
2. For Group 2: All technologies were installed between 15 January, 2016 and 1 November, 2016

As described in section C.1, Group 1 and Group 2 are not equivalent to batches. DelAgua does not separate end-users into batches, as it records the distribution date of every individual technology.

-Target group

- 1.All technologies were distributed to households

-Socioeconomic level

- 1.All technologies were distributed to Ubedehe 1 & 2 households.

As the beneficiary HHs share the above characteristics, the project population for each Group is homogenous and the sampling frame is the full list of households in each Group within the PoA database.

j. Sampling Method

Simple random sampling was utilized within each Group.

k. Sample Size

In accordance with the *Standard for sampling and surveys for CDM project activities and programme of activities*, the sample size was chosen to meet the required reliability (95/10 confidence/precision, as the sampling plan covers a group of CPAs).

The sample size for stove efficiency tests was calculated separately from those parameters monitored via survey. These calculations are discussed under the parameter $\eta_{\text{new},i,j}$ above.

For parameters monitored via survey, sample sizes were estimated for each parameter using survey results from the previous (second) monitoring period. Sample sizes were calculated for each surveyed parameter using simple random sampling. The largest ex-ante sample size was used for survey implementation. Ex-ante calculations determined that 162 surveys would need to be conducted for Group 1 and 162 surveys would need to be conducted for Group 2. DelAgua randomly selected 260 households in each group; including a buffer to account for potential nonresponse. In total, 326 households were initially surveyed; 163 in Group 2 HHs and 164 in Group 1 HHs. However, due to a server error, the data from 62 surveys was not retrievable (9 from Group 1, and 51 from Group 2). Therefore, an additional round of surveys was conducted, with 9 additional surveys in Group 1, and 51 additional surveys in Group 2. As a result, 324 valid survey results were obtained; 162 in Group 1 and 162 in Group 2. The outlier analysis was conducted on these surveys, and is discussed below.

Sample size calculations are provided to the DOE for review.

The parameter number of days that stoves are not working did not achieve the required reliability through these verification surveys. Therefore, HH visit surveys were utilized to establish this parameter, as well as the parameter 'number of days that filters are not working'. This is discussed further in section G below.

l. Sampling Frame

The sampling frame for each Group is the portion of the population that shares the key characteristics described above in section b, and is selected from the PoA level database. Samples were selected using a random number generator in Excel. Records of the sampling frame will be maintained for a period of 2 years after the lifetime of the PoA.

Data:

m. Field Measurements

Parameters that were measured via surveys are identified in section G above. All surveyed parameters are measured via in-person survey. A single survey was developed to address all monitored parameters, though the survey administered to Group 2 HHs excluded the filter-related questions (the stove-related questions were identical for Group 1 and Group 2 HHs). Survey questions are made available to the DOE for review.

n. QA/QC

The data collected during monitoring is verified and controlled in the following way:

- Group 1 surveys were initially conducted from August – December, 2016, with additional surveys taking place from September-October, 2017. The staff conducting these surveys had been previously trained on survey implementation, and so a refresher training was not necessary. Staff were provided with the revisions to survey questions.

A training was held prior to Group 2 surveys, on 16 November 2016, and included a review of the survey questions and general communication skills. All district

managers (including DMs assigned to Group 1 and Group 2 areas) participated in the training. DMs were trained on the full survey (including stove and filter questions), but were informed that the filter questions were not administered in Group 2 HHs. Participants practiced conducting interviews in group work (with newer staff paired with experienced surveyors). Following the training, new surveyors conducted 2 surveys under the supervision of experienced surveyors, to continue the training and address questions as they came up. All surveyors were provided with a printout of the verification survey and training notes, that highlighted the revisions to the survey. The initial round of Group 2 surveys started immediately following the training, and was completed by mid-December, 2016 prior to the start of verification. Additional surveys were conducted from September-October, 2017

Records of the trainings are available to the DOE.

- All ex-ante and monitored data parameters were collected on smart-phone based surveys, and surveys are uniform across all surveyors.
- Unknown to the surveyors, the database analysis includes verification of “valid” surveys including by a.) verifying household consent is received and b.) that the survey duration, as recorded by Internet time, is no shorter or longer than a reasonable value.
- Data validation is conducted on the database to ensure that values are numerically consistent, i.e. multiple choice values add up to 100% of respondents.

Data was downloaded from the PoA database, and assessed for outliers. A data point was considered an outlier if it was more than 1.5 times the inner quartile range. Datapoints identified as outliers were removed from the dataset, with the exception of two surveyed parameters:

- The number of days that stoves are not working and the number of days that filters are not working. As described below, surveys to determine these parameters were conducted nearly two years after the end of the monitoring period. Since technologies have been operating longer, it would be expected that they would have more maintenance issues that could reduce usage. Therefore, to be conservative, we did not remove outliers for these surveyed parameters. The two surveyed parameters are used to calculate the Operating Fraction for stoves and filters, respectively.
- Pot skirt usage. This value can reasonably be expected to fluctuate between 0%-100%, based on household usage patterns, and therefore no datapoints were removed.
- Quantity of Purified Water – The outlier analysis was conducted on liters/person/day; if this value exceeded 5 l/p/d, the datapoint was considered an outlier and removed from the dataset.

The number of outliers removed per parameter is as follows:

Parameter	Group 1	Group 2
Operational Check (filters)	0	NA
Operational Check (stoves)	0	0
Average HH Size	33	1
Fraction of population for which baseline fuel is biomass	0	0
Total Quantity of purified water per day - during the dry season	1	NA
Total Quantity of purified water per day - during the wet season	0	NA

Proportion of population served by a public distribution network of safe drinking water	0	NA
Fraction of total cooking that continues to be done on the baseline stove in the project scenario - during the dry season	0	0
Fraction of total cooking that continues to be done on the baseline stove in the project scenario - during the wet season	0	0
Pot skirt usage (% of cooking done with pot skirt)	9	2
Number of Days Filter is not in working order	0	NA
Number of Days Stove is not in working order	0	0
% of population that reboils water after filtering	0	NA

For the parameter 'number of days that stoves are not working', verification survey results did not meet the required reliability, as was identified by an incompleteness message. By the time DelAgua was preparing to conduct additional surveys to address the incompleteness message, annual HH visits were being conducted by CHWs (a HH visit is when CHWs revisit all households in the PoA, to reinforce key health messaging and collect feedback on technology performance). During this visit, CHWs determine the number of days that stoves/filters were not operational (both because the devices are no longer in the household, or because the stoves/filters were damaged and could not function). Therefore, DelAgua utilized the HH visit surveys to determine these parameter values.

These surveys were conducted between July, 2018 and October 1, 2018. Teams of 11 CHWs were selected in each sector by DelAgua district managers, and were invited to a one day classroom training. Typically, the CHWs had already worked with DelAgua and were familiar with the program. In cases where a CHW was not available to return, the district manager interviewed additional CHWs and invited them to the training. Following the training, CHWs administered surveys to all households in their sector. The district manager evaluated all CHWs upon completion of the training (and prior to CHWs administering surveys) across several variables, including command of the smart phone (used to collect survey information), ability to communicate, preparedness, program knowledge and general attitude; if a CHW did not achieve a 75% score, then the district manager accompanied the CHW on the first surveys to deliver additional support. District managers revisited at least 2 households surveyed by each CHW, to assess the effectiveness of the survey administered by the CHW. CHWs administered surveys to 90,369 Group 1 households (approximately 90% of all Group 1 households), and 156,362 Group 2 households (approximately 80% of all Group 2 households).

As demonstrated in the table above, all survey results were valid (no outliers were identified). Since these visits were conducted approximately two years after the end of this reporting period, they are more likely to have problems that render them inoperable, increasing the number of days that the technology was not working, and decreasing emission reductions.

It should be noted that the CHW survey was also used to set the parameter 'number of days that filters are not working'. This was not necessary because the filter surveys achieved the required confidence/precision, but was done in order to maintain consistency.

The CHW survey result was more conservative than the verification survey result (51.8 inoperable days vs. 35.46 inoperable days), so this is conservative.

The dataset is provided to the DOE for review.

o.Analysis

Once outliers were removed, the mean/proportion value was calculated, and the reliability of the results were assessed. This analysis is provided to the DOE.

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
03.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the “CDM project standard for programmes of activities” (CDM-EB93-A07-STAN); • Add a section on remarks on the observance of the scale limit of small-scale CPAs during the crediting periods; • Add "changes specific to afforestation or reforestation activities/CPA" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R PoAs between two commitment periods; • Make structural and editorial improvements.
02.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the “CDM project standard for programmes of activities (CDM-EB93-A07-STAN); • Make editorial improvements.
01.0	1 April 2015	Initial publication.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report, programme of activities		